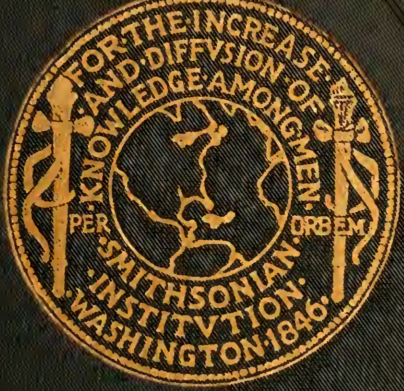
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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
Bulletin 100
VOLUME 13

CONTRIBUTIONS TO THE BIOLOGY OF THE PHILIPPINE ARCHIPELAGO AND ADJACENT REGIONS

THE FISHES OF THE GROUPS ELASMOBRANCHII, HOLOCEPHALI, ISOSPONDYLI, AND OSTAROPHYSI OBTAINED BY THE UNITED STATES BUREAU OF FISHERIES STEAMER "ALBATROSS" IN 1907 TO 1910, CHIEFLY IN THE PHILIPPINE ISLANDS AND ADJACENT SEAS

BY

HENRY W. FOWLER

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The present work forms No. 100, Volume 13, of the *Bulletin* series.

Alexander Wetmore,
Assistant Secretary, Smithsonian Institution.

Washington, D. C., *October 1, 1940.*

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THE FISHES OF THE GROUPS ELASMOBRANCHII, HOLOCEPHALI, ISOSPONDYLI, AND OSTAROPHYSI OBTAINED BY THE UNITED STATES BUREAU OF FISHERIES STEAMER "ALBATROSS" IN 1907 TO 1910, CHIEFLY IN THE PHILIPPINE ISLANDS AND ADJACENT SEAS

By Henry W. Fowler

INTRODUCTION

This is the sixth volume I have prepared dealing with a study of the fishes collected by the United States Bureau of Fisheries steamer *Albatross* in the Philippines. Since the fifth volume completed the main percoid series, the present work is somewhat of a departure, dealing with primitive fishes and following through the various groups of living forms to the more generalized bony fishes.

Most of the localities recorded herein relate to the Philippines, but other regions where the *Albatross* cruised, as the Netherlands Indies, China, Formosa, and parts of Oceania, also are listed.

As the major part of this report deals with the sharks, rays, and chimaeras, a few items concerning them seem necessary. They form a very natural assemblage of the most truly fishlike vertebrates. Equally remarkable is the nearly complete gradation from primitive sharks to the forms gradually becoming depressed like the angel sharks, saw sharks, sawfishes, guitar rays, and the skates, finally with various extremes in the more or less degenerate sting rays, eagle rays, and the giant devilfishes. Many fossils, some representing orders wholly extinct, have been discovered in various deposits, many in the Tertiary. As represented chiefly by teeth, some of these fossils apparently do not differ from fishes of the present time.

Usually because of their large size, sharks and rays are rare in collections of fishes. It is often difficult, therefore, to examine even comparatively abundant species, except for an occasional immature specimen. Though I have followed Garman largely in the arrangement of various groups and many of the species, I have included many that he overlooked or ignored. Not only is his excellent memoir strikingly incomplete in this respect, but a still greater misfortune lies in his neglect to give details about his materials.

I have followed as nearly as possible the sequence of characters as given in my preceding volumes, so that the whole series will be uniform. This is a little at variance with the method used by most ichthyologists in describing either elasmobranchs or chimaeras. Thus the *depth* of the body refers to the greatest body depth and the number of times it is contained in the body to the beginning of the lower caudal lobe, or subcaudal as it is usually termed with reference to sharks and rays. The *head* is measured from the snout tip to the first gill opening, with the same proportions, its width, in the case of sharks, referring to its length. Likewise the *snout*, measured from its tip to the eye, the *eye*, the *mouth width*, and the *interorbital* are all given with reference to the head. The space between the snout tip and the mouth is the *preoral length.* The space between the nostrils is the *internarial.* In the scale structure in the case of sharks it is quite varied and is given from microscopic examination. The fins, when present, as the dorsals and anal, are given with reference to their length in comparison with the head. The caudal is often very variable, sometimes longer than the rest of the body and usually with a well-developed lower lobe or subcaudal. In the ray-like forms the pectorals gradually widen until the body contour is a variable wide disk, often much wider than long. Its length is thus measured from the snout tip, or end, to the hind edges of the pectorals.

With respect to the bony fishes included, as the herrings, anchovies, catfishes, and carps, the same method of description is used. If the lower jaw should protrude in front, the snout length is given with the number of times it is contained in the head, followed by the phrase "from snout tip," this showing that the lower jaw is not included in the measurement. Thus the same dimensions for the head are intended to follow through the description, or until it is said to be the total length of the head. The gill rakers are counted on the first arch, those above or below being indicated by the plus sign, the former mentioned first.

The scales of bony fishes are counted in the lateral line to the caudal base or hypural bone, and such as may occur on the caudal base are so mentioned. If no lateral line is present the count is made in a similar location or axially along the side of the body. The abdominal scutes are given with a plus sign to indicate those that precede and those that follow the ventral fins. In indicating fin spines roman capitals are used, and simple or rudimentary rays are shown by means of small capitals.

As in preceding volumes acknowledgements are made to Dr. Hugh M. Smith and those of the scientific corps engaged in the work of the expedition. I wish also to acknowledge my indebtedness to

Heber A. Longman, director of the Queensland Museum in Brisbane, and Tom Marshall, of the same institution, for their kindness and assistance in showing me some of the fishes in their collections. A few of these are noted in the present work. In the designation of the type locality, if more than one locality is given by an author it is understood that the first in sequence be so restricted.

One new species is proposed herein—*Puntius sibukensis* (p. 799).

Class PISCES

Skull formed with sutures and with membrane bones, as opercle, preopercle, etc., present. Skeleton usually bony, though sometimes cartilaginous. Gill openings as one or several apertures each side of pharynx. Gills filamentous, outer edges free, bases joined to bony arches, of which usually 4 pairs and fifth pair are typically formed as tooth-bearing lower pharyngeals. Air bladder at first a lung formed on lower side of esophagus, but in later forms placed superior, becomes degraded into a swim-vessel, or entirely lost with age. Heart with auricle, ventricle, and arterial bulb. Eggs small. Fins median and paired, latter with distinct rays.

This vast assemblage of fishlike vertebrates exceeds all others of recent time. A number are known only as fossils, many of which are not sufficiently preserved to show the important characters of their anatomy.

The Leptocardii (lancelets) and Cyclostomi (lampreys), usually included with all fishlike vertebrate faunas, are not known from any undoubted fossil remains and comprise but a small number of living forms. The opinions of many writers vary as to the value of the different subclasses included in the class Pisces, though most all agree as to the status of the lancelets and lampreys. I have admitted five, the Elasmobranchii, Holocephali, Dipnoi, Crossopterygia, and Teleostomi. All but the Dipnoi and Crossopterygia, whose living members are fresh-water forms, are represented in the collections here studied.

ANALYSIS OF SUBCLASSES

a^1. Teeth not implanted in jaws; skeleton more or less incompletely of cartilage; skull without membrane bones, as opercle, peropercle, etc.; no air bladder; male with claspers.
  b^1. Jaws distinct from skull, connected by suspensory bones; teeth distinct; gill openings slitlike along side of neck, 5 to 7____ **ELASMOBRANCHII**
  b^2. Jaws coalesced with skull; teeth united and formed as bony plates; gill opening single each side of neck, leads to 4 gill slits___ **HOLOCEPHALI**
a^2. Teeth implanted in jaws; skeleton more or less bony; skull with membrane bones, as opercle, suborbitals, etc.; air bladder present; gill opening single each side of neck; no claspers__________________________ **TELEOSTOMI**

Subclass ELASMOBRANCHII

Membrane bones of head undeveloped, except sometimes rudimentary opercle. Skeleton cartilaginous. Skull without sutures. Gills not free, attached to skin by outer margin. No air bladder. Intestine with spiral valve. Arterial bulb with 3 series of valves. Optic nerve united by chiasma. Cerebral hemispheres united. Ova few, large, impregnated, and sometimes developed internally. Embryo with deciduous external gills. Skin naked or covered with minute rough scales, sometimes with spines. Tail heterocercal. Ventral fins abdominal. Male with large intromittent organs, or claspers, attached to ventral fins.

The true sharks and skates form an almost perfect gradation, though the notidanoid sharks (Diplospondyli) are somewhat removed from the former. Besides those included below, an extinct order of sharks, the Ichthyotomi, with simple claspers, is known from early fossils. The vernacular name "shark" is usually given as derived from *carcharus* or *carcharias*, with reference to the sharp teeth.

ANALYSIS OF ORDERS

a^1. Anal fin present.
  b^1. Gill openings 6 or 7; dorsal fin single---------------- **DIPLOSPONDYLI**
  b^2. Gill openings 5; dorsal fins double---------------- **ASTEROSPONDYLI**
a^2. No anal fin.
  c^1. Gill openings lateral.
    d^1. Pectoral fins normal---------------- **CYCLOSPONDYLI**
    d^2. Pectoral fins modified, large, expanded horizontally and extended forward at base in front, which separated from neck by deep notch containing gill openings---------------- **SQUATINAE**
  c^2. Gill openings ventral---------------- **RAJAE**

Order DIPLOSPONDYLI

Vertebral column imperfectly segmented, each segment equivalent to 2 vertebrae and bearing 2 neural arches. Gill openings 6 or 7. Dorsal fin single. Anal present.

The most primitive of existing sharks, with two families, recent and extinct.

ANALYSIS OF FAMILIES

a^1. Gill openings 6 or 7, their covers not crossing throat; teeth compressed, bladelike, notched on edges; mouth inferior---------------- **Heptranchidae**
a^2. Gill openings 6, their anterior covers crossing throat; teeth with 3 long sharp cusps; mouth terminal---------------- **Chlamydoselachidae**

Family HEPTRANCHIDAE

Body moderately long. Head long, depressed. Snout protruding. Eyes lateral, anterior, or submedian, without nictitating membrane.

Mouth inferior, large, arched forward, with labial folds at angles on lower jaw. Teeth in jaws dissimilar, comblike, compressed, bases slender, pointed cusps of variable number. Nostrils inferior, near snout end, without grooves to mouth. Gill openings wide, 6 or 7, before pectorals. Spiracle small, lateral on neck. One dorsal, spineless, opposite and like anal. Caudal long, without pits, subcaudal well developed.

Genera few and widely distributed in warm or tropical seas. Fossils, chiefly fragments as teeth, are found in Cretaceous and Tertiary deposits. The living forms are viviparous. I do not accept Garman's compound family name Hexeptranchidae, as *Heptranchias* is the earliest generic name, thus eventuating Heptranchidae.

ANALYSIS OF GENERA

a^1. Gill openings 7.. Heptranchias
a^2. Gill openings 6.. Hexanchus

Genus HEPTRANCHIAS Rafinesque

Heptranchias RAFINESQUE, Caratteri animali piante Sicilia, p. 13, 1810. (Type, *Squalus cinereus* Gmelin, monotypic.)

Heptranchus MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 81, 1841. (Type, *Squalus cinereus* Gmelin.)

Aellopos (not Hübner, 1816) AGASSIZ, Poissons fossiles, vol. 3, p. 376, 1843. (Type, *Aellopos wagneri* Agassiz, designated by Fowler, Geol. Surv. New Jersey Bull. 4, p. 24, 1911.) (Fossil.) (*Aellopus* Koch, 1842, and *Aellopus* Wolf, 1871, not involved.)

Notorynchus AYRES, Proc. California Acad. Sci., vol. 1, p. 72, 1855. (Type, *Notorynchus maculatus* Ayres, monotypic.)

Notorhynchus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 149. (Type, *Notorynchus maculatus* Ayres.)

Notidanion JORDAN, Stanford Univ. Publ. Biol. Sci., vol. 3, p. 97, 1923. (Type, *Notidanus primigenius* Agassiz, monotypic.) (Fossil.)

Body elongate, partly fusiform, compressed. Head wide, depressed, sometimes tapering forward. Mouth large, broad, with fold from angle on lower jaw and deep groove behind angle. Lower teeth uniform or decreasing toward mouth angles; cusps of cutting edge more or less regularly graduated. Nostrils advanced. Gill openings seven. Spiracle small. Dorsal small, behind ventrals. Caudal long.

HEPTRANCHIAS DAKINI Whitley

Heptranchias dakini WHITLEY, Australian Zoologist, vol. 6, p. 310, 1931 (on McCulloch); Mem. Queensland Mus., vol. 10, pt. 4, p. 197, 1934 (reference).

Heptranchias perlo (not Bonnaterre) MCCULLOCH, Zool. Res. *Endeavour*, vol. 1, p. 2, pl. 1, fig. 1, 1911 (type locality: 60 miles south of Cape Everard, Victoria).

According to Whitley, this species appears to differ from the European *Heptranchias perlo* (Bonnaterre) in having the head 4½ in total length and anal fin originating below the middle of the dorsal, with its base shorter than that of the dorsal.

ANALYSIS OF SPECIES

a^1. Notorynchus. Head broad; snout broad.
  b^1. No median tooth in upper series; primary cusp of lower lateral teeth with denticles of inner edge weak or absent____________________ **cepedianus**
  b^2. Median tooth in upper series; primary cusp of lower lateral teeth denticulate on inner edge_______________________________________ **pectorosus**
a^2. Heptranchias. Head tapering; snout narrow_______________________ **perlo**

Subgenus NOTORYNCHUS Ayres

HEPTRANCHIAS CEPEDIANUS (Péron)

Squalus cepedianus Péron, Voyage Australes, vol. 1, p. 337, 1807; *ibid.*, ed. 2, vol. 2, p. 218, 1824 (type locality: Adventure Bay, Tasmania; Baudin's Expedition). (Not consulted.)

Notorynchus cepedianus Whitley, Mem. Queensland Mus., vol 10, pt. 4, pp. 181, 197, 1934 (North Island, New Zealand).

Squalus platycephalus Tenore, Mem. Acad. Ponton. Napoli, vol. 1, pp. 241, 258, pl. 4, 1809 (type locality: Naples, Italy).

Notorynchus platycephalus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 18, 1913 (Mediterranean, Indian Ocean, East and North Pacific).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 188 (off Cape of Good Hope).

Notorhynchus platycephalus Chevey, Inst. Océanogr. Indochine, 19ᵉ note, p. 5, 1932 (Cochinchina).

Heptranchias platycephalus Barnard, Ann. South African Mus., vol. 21, pt. 2, p. 1012, 1927 (compiled).—Fowler, Hong Kong Nat., vol. 1, p. 28, fig. 1, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (California; Indian Ocean).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, no. 8, p. 215, fig. 1, 1932 (Chefoo; Tsingtau; Ningpo; Chusan).—Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 87, 1933 (Chusan).—Tanaka, Jap. Fish. Life Colours, no. 3, 1933.

Notidanus indicus Agassiz, Poissons fossiles, pl. E, fig. 1, Feuilleton, pp. 71, 92, pl. E, figs. 1–4 (teeth), 1835 (type locality: "Indes Orientales").—Günther, Cat. Fishes British Mus., vol. 8, p. 398, 1870 (Cape Seas).—Day, Fishes of India, pt. 4, p. 723, pl. 189, fig. 4, 1878 (Madras and Cape Seas example).—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).—Day, Fauna British India, Fishes, vol. 1, p. 30, fig. 10, 1889.—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 43, 1890 (reference).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 64, 1929 (Cochinchina).

Notidanus (*Heptanchus*) *indicus* Peters, Monatsb. Akad. Wiss. Berlin, 1880, p. 926 (Ningpo).

Heptanchus indicus Müller and Henle, Syst. Beschr. Plagiostomen, p. 82, pl. 32 (teeth), 1841 (Indian Ocean).—Schlegel, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 303, 1850 (Japan).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 21, 1853 (Japan and West India); vol. 26, p. 42, 1857 (Japan); Nat. Tijdschr. Nederland. Indië, vol. 21, p. 58, 1860 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 434, 1865 (part).—Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 119, 1874 (compiled; China).

Notorynchus maculatus Ayres, Proc. California Acad. Sci., vol. 1, p. 72, 1855 (type locality: California).

Notorhynchus maculatus JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, p. 17, 1896 (Monterey to Washington); pt. 4, pl. 2, fig. 7, 1900.

Notorhynchus borealis GILL, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 150 (type locality: Nisqually, Oreg.; jaws).

Eye 3¼ in snout; nostril 5½, anterior, close to snout edge. Spiracle small, 2⅔ eye diameters behind eye.

Scales with strong median keel, pointed forward and slender lobe behind.

Subcaudal 4¼ in caudal; pectoral width 1⅗ in its length.

Back dark gray, spotted all over with black, more on sides. Lateral line white. Eye white, sprinkled with pale gray.

South Africa, Indian Ocean, China, Japan. Also in the Eastern Pacific in Washington, Oregon, and California and the Atlantic.

1 example. A.N.S.P. Off Cape Colony coast, in 40 fathoms. Specimen skinned out, 1,930 mm. long. H. W. Bell Marley.

HEPTRANCHIAS PECTOROSUS Garman

Heptranchias pectorosus GARMAN, Bull. Essex Inst., vol. 16, p. 56, pl., 1884 (type locality: Patagonia).—BARNARD, Ann. South Afric. Mus., vol. 21, p. 21, pl. 1, fig. 1, 1925 (copied Day) (Agulhas Bank).—FOWLER, Proc. 4th (1929) Pacific Sci. Congress, Java, p. 484, 1930 (reference).

Notorynchus pectorosus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 20, 1913 (Patagonia, New Zealand, Australia).

Notorhynchus pectorosus McCULLOCH, Australian Zool., vol. 1, no. 7, p. 219, fig. 3, 1919.—WAITE, Rec. South Australian Mus., vol. 2, p. 10, fig. 5, 1921.—McCULLOCH, Australian Zool. Handbook, vol. 1, p. 4, fig. 3a, 1922.—WAITE, The fishes of South Australia, p. 24, figs. 1923.—PHILLIPS, New Zealand Journ. Sci. Techn., vol. 6, p. 259, fig. 1, 1924 (Hokitika).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 4, pl. 1, fig. 3a, 1927.

Heptranchus indicus (not Agassiz) MACDONALD and BARRON, Proc. Zool. Soc. London, 1868, p. 37, pl. 33 (Bass Straits).—THOMPSON, Marine Biol. Rep. South Africa, No. 2, p. 34, 1914.

Notidanus indicus HUTTON, Colonial Mus. Geol. Survey Dept. (Fishes of New Zealand), p. 79, 1872; Trans. New Zealand Inst., vol. 5, p. 271, 1873.—HUTTON, Trans. Proc. New Zealand Inst., vol. 8, p. 276, 1876.—RAMSAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6. pp. 296, 360, 1881 (Jervis Bay, Port Jackson).—JOHNSTON, Proc. Roy. Soc. Tasmania, 1882, p. 138, 1883.—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 6, 1888 (Port Jackson, Broken Bay, Botany Bay).—PARKER, Nature, vol. 43, p. 142, fig., 1890 (sternum).—JOHNSTON, Proc. Roy. Soc. Tasmania, 1890, p. 38, 1891 (Tasmania).

Notidanus (Heptanchus) indicus McCOY, Prodromus Zool. Victoria, vol. 5, dec. 5, pl. 43, fig. 2, 1880 (Hobsons Bay).

Heptanchus indicus CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 217, 1872 (Hobsons Bay).—HASWELL, Proc. Linn. Soc. New South Wales, vol. 9, pp. 88, 381, pl. 1, fig. 5, pl. 10, figs. 1–2, 1884.—OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 4, p 19, 1889.

Heptranchias indicus Waite, Rec. Canterbury Mus., vol. 1, no. 1, p. 6, 1907 (reference).

Notorhynchus indicus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 37, 1901 (reference).—Waite, Mem. New South Wales Nat. Club, No. 2, p. 5, 1904.—Stead, Fishes of Australia, p. 232, 1908.

Notorhynchus indicus Zietz, Trans. Roy. Soc. South Australia, vol. 32, p. 289, 1908 (South Australia).

Heptranchus griseus (not Rafinesque, 1810) Regan, Proc. Zool. Soc. London, 1873, p. 312 (off Flinders Island, Bass Strait).

Notorynchus griseus McCulloch, Australian Mus. Mem., vol. 5, p. 3, 1929 (reference).

Notorynchus macdonaldi Whitley, Rec. Australian Mus., vol. 18, p. 138, pl. 20, figs. 3–5, 1931 (type locality: Manly, New South Wales).—Phillips, New Zealand Journ. Sci. Techn., vol. 16, p. 236, fig. 1, 1935 (Oriental Bay).

Heptranchias macdonaldi (Ogilby) Whitley, Rec. Australian Mus., vol. 18, p. 139, 1931 (name in synonymy).

Depth ? ; head 5½ to subcaudal origin, width 1⅕ its length. Snout 2¼ in head; eye 8½, 3½ in snout, 6 in interorbital; dentary width 1⅖ in head, length 1½ its width, lower labial fold about ⅓ of lower ramus; teeth compressed, bases quadrate, cusps narrow, 15 rows above, 13 below; upper teeth with 2 denticles of which inner cusp greatly larger, narrower, each of lower larger and with 5 subequal cusps; nostrils small, about first third in preoral length, internarial 2½ in dentary width; interorbital 1⅘ in head, broad, slightly convex. Gill openings equidistant, graduated smaller from first which largest, last before pectoral base and less than half first. Spiracle small pore, high, much nearer gill opening than eye.

Scales quindentate, median point much longest and basally 3 short parallel keels.

Dorsal origin above hind basal edge of ventral, front edge 1⅞ in head, hind lobe ends in narrow triangular point; anal origin opposite middle of dorsal base, front edge 1⅔ in its length which 2⅕ in head and ends in short narrow point behind; caudal about 2⅓ in rest of body, subcaudal lobe 4⅓ in caudal length; pectoral 1⅒ in head, width 1¼ its length; ventral slightly longer than pectoral, with thick conic claspers reaching far back as end of ventral lobe.

Brown, paler or lighter uniform brown below. Entire upper surface irregularly though finely and obscurely sprinkled with darker spots or specks. Scattered dark spots occur on upper surfaces of paired fins.

South Africa, South Australia, New South Wales, Victoria, Patagonia. My example agrees with Garman's diagnosis of a median tooth in its upper series and the median lower tooth without a median cusp.

U.S.N.M. No. 39973. Port Jackson, New South Wales. Australian Museum. Length, 1,770 mm. Head and body skinned out.

Subgenus HEPTRANCHIAS Rafinesque

HEPTRANCHIAS PERLO (Bonnaterre)

Squalus perlo BONNATERE, Tableau Encyclop. Ichth., p. 10, 1788 (type locality: Mediterranean) (on *Perlon* Broussonet).

Heptranchias perlo MCCULLOCH, Biol. Res. *Endeavour*, vol. 1, p. 2, pl. 1, fig. 1, 1909–1910 (60 miles south of Cape Everard, Victoria).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 21, pl. 56, fig. 1 (heart), pl. 58, fig. 1 (intestine), 1913 (Mediterranean, Japan).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 4, pl. 1, fig. 4a, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 483, 1930 (Japan); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 27, fig. 3, 1936 (Italy).

Squalus cinereus GMELIN, Syst. Nat. Linn., vol. 1, p. 1497, 1789 (type locality: Mediterranean).

Notidanus cinereus BONAPARTE, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 12, descr., pl. 137, fig. 2, 1835 (Rome, Naples, Sicily).

Heptranchias cinereus BONAPARTE, Icon. Fauna Ital., Pesci, vol. 3, pt. 1, in "indice" (name only); Cat. Metod. Pesci. Europei, p. 17, 1846 (Mediterranean).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 52 (Bonaparte material).

? *Monopterhinus ciliaris* BLAINVILLE, Bull. Soc. Philom. Paris, 1816, p. 121 (name only).

Notidanus monge var. *griseus* (Risso) BONAPARTE, Cat. Metod. Pesci. Europei, p. 17, 1846 (name in synonymy).

Notidanus monge var. *albescens* (Risso) BONAPARTE, idem. (name in synonymy).

Notidanus monge var. *rubescens* (Risso) BONAPARTE, idem. (name in synonymy).

Heptancus angio COSTA, Fauna Napoli, Pesci, p. 5, pls. 13–14, fig. 3, 1857 (teeth) (type locality: Naples, Italy).

Notidanus ferox PEREZ, Estudios sobre algunos escualos de la costa de Chile, p. 7, 1886 (type locality: Chile).—PHILIPPI, Anal. Univ. Chile, vol. 71, p. 555, pl. 6, fig. 1, 1887.—QUIJADA, Boll. Mus. Nac. Chile, vol. 5, pt. 1, p. 112, 1913 (Cartejena).

Heptranchias haswelli OGILBY, Proc. Linn. Soc. New South Wales, vol. 22, p. 62, 1897 [type locality: "Cape of Good Hope" ? (Australia)].

Notidanus medinae PHILLIPI, Anal. Univ. Chile, vol. 109, p. 305, 1901 (type locality: Cartejena, Chile).

Notidanus wolniczkyi PHILLIPI, Anal. Univ. Chile, vol. 109, p. 307, 1901 (type locality: Coquimbo, Chile).—QUIJADA, Boll. Mus. Nac. Chile, vol. 5, pt. 1, p. 112, 1913 (Coquimbo).

Notidanus wolniczkii PHILLIPI, Anal. Univ. Chile, vol. 109, pl., 1901 (4 upper figures of teeth).

Heptranchias deani JORDAN and STARKS, Proc. California Acad. Sci., ser. 3, vol. 2, p. 384, 1901 (type locality: Misaki, Japan).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 128, 1901 (Misaki; Nagasaki).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 595, 1903 (type).—PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 708, 1908 (Japan).

Depth 10 to 10¾ to end of caudal fin; head 6⅖ to 6½, width 1⅕ its length. Snout 3 in head; eye 4 to 4½, 2 to 2½ in snout, 3 in interorbital; mouth length 2¼ to 2⅓ in head, mandible width 2⅓, lower labial fold nearly ½ lower ramus; teeth compressed, upper without median tooth though with lower tricuspid median tooth, 18 to 20 rows above, 10 below; upper teeth each with slender curved hooked cusp, in front simple and some outer or hind ones, of latter 1 or 2 minute; lower teeth each with 6 or more cusps, very small notch in front, second cusp enlarged, others following small; nostrils small, lateral on side of snout, nearly midway in space between snout tip and front of mouth; interorbital 3⅙ to 3¾ in head, moderately broad, little depressed. Gill openings equidistant, graduated smaller from first which largest and extends forward last third in head, last before pectoral base.

Scales minute, median point much longest, 3 keels with median longest and strongest.

Dorsal origin opposite depressed ventral tips, front edge 2⅖ to 2⅔ in head, hind lobe ends in narrow short point; anal origin opposite middle of dorsal base or little posterior, front edge 3⅚ to 4¼; caudal 2 to 2⅖ in rest of body, subcaudal front edge 2 to 2⅛ in head; least depth of caudal peduncle 4; pectoral 1⅖ to 1⅗, width 1⅕ to 1⅓ its length; ventral 2.

Dull gray brown above, paler to whitish below. Fins dull brownish. Iris pale yellowish brown.

Japan, New South Wales, Victoria. In the eastern Pacific at Chile and also in the Atlantic and Mediterranean.

A.N.S.P. nos. 542, 543, Italy. C. L. Bonaparte (no. 245). Length, 815 to 840 mm.

2 examples, A.N.S.P. No data. Two dried skins.

Genus HEXANCHUS Rafinesque

Hexanchus Rafinesque, Caratteri animali piante Sicilia, p. 14, 1810. (Type, *Squalus griseus* Bonnaterre, monotypic.)

Hexancus Agassiz, Nomencl. Zool., Index, p. 181, 1846. (Type, *Squalus griseus* Bonnaterre.)

Monopterhinus Blainville, Bull. Soc. Philom. Paris, 1816, p. 121. (Type, *Squalus griseus* Bonnaterre.)

Notidanus Cuvier, Règne animal, vol. 2, p. 128, 1817. (Type, *Squalus griseus* Bonnaterre, designated by Jordan and Evermann, Genera of fishes, pt. 1, p. 97, 1917.)

Notidamus Münster, Beitr. Petrefak., vol. 5, p. 66, 1842.—Desmarest, *in* Chenu's Encyclop. Hist. Nat., vol. 19, p. 349, 1874. (Type, *Squalus griseus* Bonnaterre.)

Body partly cylindrical, cavity little over half total. Eyes lateral. Mouth width shorter than skull, crescentic, with rudimentary labial fold on lower jaw at angle. Teeth dissimilar, anterior upper raptorial, lower teeth sectorial and compressed in cusps and bases. Gill openings 6, edge of first gill cover not free across isthmus. Spiracle small, on side of neck. Dorsal single, spineless, nearly opposite anal. Caudal axis low and no caudal pit, subcaudal present.

Tropical and subtropical seas.

HEXANCHUS GRISEUS (Bonnaterre)

Squalus griseus BONNATERRE, Tableau Encyclop. Ichth., p. 9, 1788 (type locality: Mediterranean) (on *Le griset* Broussonet, Mém. Acad. Sci. Paris, 1780, p. 663).—CUVIER, Règne animal, vol. 2, p. 128, 1817 (reference).

Hexanchus griseus MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 80, 1841 (Mediterranean; Atlantic Ocean).—GUICHENOT, Notes Île Réunion, vol. 2, p. 30, 1863.—REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 16, p. 571 (part), 1905.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 52 (no locality).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 16, 1913 (Nice).—NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 319, 1922 (Natal).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 22, 1925 (Agulhas Bank and Natal coast).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (compiled).—TANAKA, Jap. Fish. Life Colours, No. 4, 1933.—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 26, 1936 (compiled).

Squalus vacca SCHNEIDER, Syst. Ichth. Bloch, p. 138, 1801 (no locality).

Monopterhinus colombinus BLAINVILLE, Bull. Soc. Philom. Paris, 1816, p. 121 (name only).

Notidanus monge RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 129, 1826 (type locality: Nice).

Hexanchus corinus JORDAN and GILBERT, Proc. U. S. Nat. Mus., vol. 3, p. 352, 1880 (type locality: Neah Bay, Wash.).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 17, 1913 (type).

Notidanus vulgaris PEREZ, Estudios sobre algunos escaulos de la costa de Chile, p. 8, 1886 (type locality: Chile).—PHILIPPI, Anal. Univ. Chile, vol. 71, p. 554, pl. 6, fig. 1, 1887 (Santiago).—QUIJADA, Boll. Mus. Nac. Chile, vol. 5, pt. 1, p. 112, 1913 (San Antonio, Chile).

Depth about 7¾ to subcaudal origin, head 5, width nearly equals length. Snout 2¾ in head; eye 6½, 2¼ in snout, 3⅗ in interorbital; mouth width about 1⅖, groove behind angle apparently reaching halfway to first gill opening, with lower labial fold apparently 2¾ ramus of lower jaw; anterior upper teeth larger, with single cusp, narrowly triangular or pointed, posterior lateral teeth single cusp, lower, smaller, more inclined; lower jaws with median tooth, short, low cusp directed to right, other teeth each with 5 cusps for anterior and 6 for posterior; preoral length 3½ in head; nostril about half of orbit, about midway between snout end and eye, internarial 3 in head; interorbital 1⅘, broad, depressed. Gill openings 6, first largest or about 3 in head, last before pectoral base.

Scales minute, tricarinate and tridentate. Double row of enlarged simple denticles, upper surfaces convex, all along upper edge of caudal fin.

Dorsal origin behind ends of depressed ventrals, front fin edge 2⅖ in head; anal origin below middle of second dorsal base, front fin edge 3⅗ in head; caudal length 2⅗ in rest of body; front subcaudal edge 4⅔ in caudal fin length; least depth of caudal peduncle 4⅓ in head; pectoral 1⅔, width 1⅖ its length; ventral length 1⅔ in head.

Uniformly drab to bister above, pale or grayish below. Fins uniform like body.

South Africa, Natal, Reunion. Also in the Eastern Pacific at Washington and Chile and in the Atlantic.

A.N.S.P. No. 34639. No data [likely Italy?]. No. 43. Length, 747 mm. Dried skin.

Family CHLAMYDOSELACHIDAE

Body elongated and slender. Head wide and depressed. Snout wide. Eyes lateral, without nictitating membranes. Mouth nearly terminal, without grooves to nostrils. Teeth alike in two jaws, rows oblique, bases extend back, with 3 long slender cusps. Nostrils separate from mouth. Gill openings 6, anterior covers crossing throat. Spiracle present, small. Intestine with spiral valve. Lateral line an open groove. Dorsal posterior, spineless. Anal large. Caudal long, axis low, without pits. Pectorals small.

Genus CHLAMYDOSELACHUS Garman

Chlamydoselachus Garman, Bull. Essex Inst., vol. 16, p. 47, 1884. (Type, *Chlamydoselachus anguineus* Garman, monotypic.)

Chlamydoselache Günther, Rep. Voy. *Challenger*, vol. 22, p. 2, 1887. (Type, *Chlamydoselachus anguineus* Garman.)

Body uniformly slender. Tail greatly compressed and tapering to point. Head small. Snout depressed. Eyes small, elongate, advanced. Pupil horizontal. Mouth very wide, extends far back of eye, without labial folds. Teeth raptorial, alike in two jaws, each with broad base and three slender, curved, subconic cusps, with or without rudimentary cusps; no median teeth in upper series; median lower symphyseal series. Nostrils large, lateral on snout, little inferior. Opercle forms broad frill over first gill. Edge of first gill opening free across isthmus. Fins wide. Caudal not notched.

Fossils are known from teeth in the Pliocene of Tuscany.

CHLAMYDOSELACHUS ANGUINEUS Garman

Chlamydoselachus anguineus Garman, Bull. Essex Inst., vol. 16, 1884, p. 47, figs. (type locality: Japanese Seas); Science, vol. 3, p. 116, text fig., 1884 (Japan); Bull. Mus. Comp. Zool., vol. 12, no. 1, p. 1, pls. 1–12, 1885 (anatomy); vol. 17, p. 82, pl. 15, 1888 (lateral canal system).—Goode and Bean, Oceanic ichthyology, p. 22, pl. fig. 6, 22, 1895 (copied).—Ishikawa, Annot. Zool. Japon., vol. 2, p. 95, pl. 4, 1898 (young).—Garman, Mem. Mus. Comp. Zool., vol. 24, p. 41, pl. 7, 1899 (lateral canal system) (type; Tokyo).—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 37 (off Yokohama), p. 128 (reference), 1901.—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 596, 1903 (Kuro Shiwo, off Izu, Sagami, Awa).—Stead, Zool. Anz., vol. 32 p. 303, 1907 (Port Jackson, Australia).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 14, pl. 59, figs. 4–5 (egg), fig. 6 (branchial skeleton), pl. 61, figs. 7–8 (embryo), 1913 (Sagami Sea).—Izuka and Matsuura, Tokyo Museum

(Vertebrates) p. 191, 1920 (Tokyo market).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 99, 1925 (Sagami Bay).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (Japan).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 4, 1930 (Far East seas).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 3, 1931 (Tokyo).—TANAKA, Jap. Fish. Life Colours, No. 5, 1933.—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 24, fig. 2, 1936 (Japan).

Chlamydoselache anguinea GÜNTHER, Rep. Voy. *Challenger*, vol. 22, p. 2, pls. 64, 65, 1887 (Yeddo Bay opposite Tokyo).

Didymodus anguineus COPE, Amer. Nat., vol. 18, p. 413, 1884 (note).

Chlamydoselachus sp. STEAD, Proc. Linn. Soc. New South Wales, vol. 32, p. 554, 1907 (Port Jackson).—MCCULLOCH, Fishes of New South Wales, ed. 2, 1927, p. 4.

Depth 8½ to subcaudal origin; head measured to hind edge of first gill opening 5⅛, width 1¾. Snout 3⅕ in head; eye 8⅓, 2¾ in snout, 3½ in interorbital, depth 1⅗ its length; mouth cleft, from snout tip 1⅗ in head, width 1¼ its length; teeth in 13 rows each side above though without median row in front, 11 rows each side below with row at symphysis, not over 6 teeth in row; teeth alike in jaws, tricuspid, interspace basally between each cusp usually with small denticle; nostril rather large, lateral, inferior on side of snout, internarial space 4 in head; interorbital 2⅖, broad, slightly convex. Gill openings very large, first longest.

Scales all form finely roughened skin, very small and each forms flat triangular point with smooth surface.

Dorsal length 1 in head; anal length 1; least depth of caudal peduncle 4½; pectoral 1½, width 1⅘ its length; ventral length, to hind edge of clasper, 1 in head; clasper conic, with deep groove, deeply cleft basally, length 1¾ in head.

Uniform drab-brown, fins slightly darker terminally. Iris slaty. Teeth pale or whitish.

Japan, New South Wales.

U.S.N.M. No. 48530. Japan. Prof. M. Mitsukuri. Length, 1,200 mm.

Order ASTEROSPONDYLI

Vertebral column well segmented, each segment forming a neural arch and one centrum. Vertebrae each with internal calcareous lamellae radiating from central ring. Gill openings 5. Two dorsal fins. Anal fin present.

Includes the greater number of living sharks.

ANALYSIS OF FAMILIES

a^1. HETERODONTOIDEI. Each of 2 dorsals with fixed spine; snout short; mouth narrow, lobed, folded; no nictitating membrane; teeth raptorial forward, molarial backward; nasoral grooves present; spiracles present; caudal short, axis raised______________________________________ Heterodontidae

a^2. Dorsal fins without spines.

b^1. Eye without nictitating membrane.

c^1. Caudal moderate or small, less than half of entire fish.

d^1. Last gill opening above pectoral base.

e^1. First dorsal lobate, median, or postmedian.

f^1. Scyliorhinoidei. Caudal peduncle without keel each side; teeth raptorial; nasoral grooves present or absent; spiracles present; 2 dorsals (1 in *Pentanchus*); caudal axis little raised, subcaudal not produced.

g^1. Caudal short, axis not raised; nasal cirri absent or present; nasoral grooves absent or rudimentary------ **Scyliorhinidae**

g^2. Caudal long, axis little raised; nasoral grooves and nasoral cirri present------------------------------------ **Orectolobidae**

f^2. Isuroidei. Caudal peduncle with lateral keel each side; caudal lunate or subcaudal well developed; caudal peduncle often with keel on each side; snout pointed, variously long or short; no nasoral groove; spiracles present, rarely absent.

h^1. Gills without strainers; teeth large, subulate or triangular, entire or serrate---------------------------------- **Isuridae**

h^2. Gills with strainers; teeth minute; size enormous.

i^1. Snout subconic; eyes above forward end of mouth; gill openings extend nearly around neck--------- **Halsydridae**

i^2. Snout broad; eyes near mouth angles; gill openings moderately wide, last above pectoral base-- **Rhincodontidae**

e^2. Pseudotriakoidei. First dorsal low, long keel, premedian. **Pseudotriakidae**

d^2. Carcharoidei. Last gill opening entirely before pectoral base; caudal moderate, axis low; snout variously short to very long-- **Carchariidae**

c^2. Alopioidae. Caudal longer than body, axis rather low; snout short, conic-- **Alopiidae**

b^2. Sphyrnoidei. Nictitating membrane present; head attenuated, sometimes expanded across interorbital region; teeth various, compressed or triangular, sometimes in bands or pavements; nasoral grooves absent (except *Scylliogaleus*); caudal axis slightly raised, subcaudal produced.

j^1. Head not expanded across orbital region. **Galeorhinidae**

j^2. Head well expanded across orbital region, kidney-shaped to greatly hammer-shaped---------------- **Sphyrnidae**

Family HETERODONTIDAE

Body thick set anteriorly, somewhat trihedral, rather short. Head thick, high, large, supraorbital ridges prominent. Snout projects but little in front. Eyes lateral, small. Mouth narrow, terminal. Upper lip with 7 lobes and fold on lower lip. Teeth alike in jaws, small and conic in front, large molars behind. Nostrils with 2 thick valves, inferior, nearly terminal, with grooves to mouth. Gill openings 5, of which several above pectorals. Spiracle small, below eye. Scales fine, carinate. Dorsals two, moderate, strong spine on each, first opposite space between pectorals and ventrals, second before anal. Caudal tip usually notched, fin short, mostly bent up. Anal small.

Small sharks of warm or tropical Pacific waters, of interest chiefly from their abundance as fossils of Mesozoic time. The few recent forms belong to the genus *Heterodontus*. Their food is apparently mollusks, the shells of which are crushed by means of the molar or pavementlike teeth. They are oviparous and the large egg cases of unusual spiral form with two long tendrils. Owing to the large blunt head the common name of Bullhead Sharks has been applied, though as the oldest known species is from Australia that of Port Jackson Shark has gained most usage.

Genus HETERODONTUS Blainville

Heterodontus BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816. (Type *Squalus philippi* Schneider, monotypic.) (*Heterodon* Latreille in reptiles not involved.)

Cestracion SCHAEFFER, Epistola . . . studii ichthyologici, etc., p. 20, 1760.—OKEN, Isis, 1817, p. 1183. (On Cuvier, Règne animal, vol. 2, p. 129, 1817. Type, *Squalus philippi* Schneider, monotypic.)

Centracion GRAY, Zool. Misc., p. 5, 1831. (Type, *Centracion zebra* Gray, monotypic.) (Evidently variant spelling of *Cestracion*.)

Gyropleurodus GILL, Proc. Acad. Nat. Soc. Philadelphia, 1862, p. 331. (Type, *Cestracion francisci* Girard, monotypic.)

Tropidodus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 489. (Type, *Cestracion pantherinus* Gill, monotypic.)

Drepancphorus EGERTON, Mem. Geol. Surv. Great Britain, 1872, dec. XIII, no. 9. (Type, *Acrodus rugosus* Agassiz.) (Fossil.)

Molochophrys WHITLEY, Australian Zool., vol. 6, p. 310, 1931. (Type, *Cestracion galeatus* Günther, orthotypic.)

Wuia FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 233, 1934. (Type, *Centracion zebra* Gray, orthotypic.)

Body robust, heavy forward. Head oblong, broad. Snout blunt. Eye high, ridges above mostly prominent, without nictitating membranes. Mouth small, with thick labial folds on both jaws. Front teeth pointed, with 3 to 5 cusps in young; hind molars twice broad as long, in oblique series and in one series enlarged. No narial cirri. Crown of head narrowed between prominent supraorbital ridges. Gill openings narrow. Spiracle near lower eye edge. Scales small, sometimes cruciform. Caudal short, subcaudal well developed. Pectorals large.

Besides the species noticed below the others are all from the Eastern Pacific. They are *Heterodontus francisci* (Girard), *Heterodontus quoyi* (Freminville), and *Heterodontus peruanus* (Evermann and Radcliffe) and form the subgenus *Gyropleurodus* with spotted coloration.

ANALYSIS OF SPECIES

a^1. Heterodontus. Anal base less than 2 times its length from subcaudal origin.
  b^1. First dorsal origin above midpectoral base; dark bands on body both transverse and longitudinal-------------------------- portus jacksoni
  b^2. First dorsal origin above hind portion or end of pectoral base; dark bands on body transverse and broad to absent.
    c^1. Anal base 1¼ times its length from subcaudal origin-------- japonicus
    c^2. Anal base 1½ times its length from subcaudal origin-------- galeatus
a^2. Wuia. Anal base two or more times its length from subcaudal origin; dark transverse body bands narrow-----------------------------------zebra

Subgenus HETERODONTUS Blainville

Anal base less than 2 times its length from subcaudal origin.

HETERODONTUS PORTUS JACKSONI (Meyer)

Squalus portus jacksoni Meyer, Zool. Entdeck., p. 71, 1793 (on Port Jackson Shark Phillip, Voy. Gov. Phillip to Botany Bay, p. 166, pl. 42, 1789; type locality: Botany Bay).

Heterodontus portus jacksoni Whitley, Mem. Queensland Mus., vol. 10, pt. 4, pp. 181, 197, pl. 27, fig. A, 1934 (Manly, New South Wales).

Squalus jacksoni Suckow, Naturgeschichte der Thiere, vol. 4, p. 102, 1799 (type locality: Port Jackson).

Squalus jacksonii Turton, A general system of nature . . . Linné, vol. 1, p. 922, 1806.—Bullock, Companion Bullock's Mus., ed. 8, p. 60, 1810 (Port Jackson); ed. 17, p. 90, pl., figs. 1–2, 1814.

Squalus philippi Schneider, Syst. Ichth. Bloch, p. 134, 1801 (type locality: Botany Bay, New South Wales) (on Phillip, Voy. Gov. Phillip to Botany Bay, p. 166, pl. 42, 1789).—Cuvier, Règne Animal, vol. 2, p. 129, 1817 (compiled).

Heterodontus philippi Blainville, Bull. Soc. Philom. Paris, 1816, p. 121 (name only).—Gray, List fish British Mus., p. 66, 1851 (South Australia, Port Jackson, Port Lincoln).—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 97, 1880 (Port Jackson).—Kent, Oysters and oyster fisheries Queensland, p. ??, 1891.—Waite, Prelim. Rep. *Thetis* Exped., p. 39, 1898 (New South Wales).—Stead, Fishes of Australia, p. 232, fig. 234 (teeth), 1906.—McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 2, 1911 (between Newcastle and Port Stephens, Shoalwater Bight, mouth Murray River, 50 miles southeast Wiles and Spencer Gulf, 15 to 75 fathoms).—Waite and McCulloch, Trans. Roy. Soc. South Australia, vol. 39, p. 459, 1915 (Great Australian Bight, 8 to 94 fathoms).—Waite, Rec. South Australian Mus., vol. 2, p. 10, fig. 6, 1921.—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 127, 1925 (reference).—McCulloch, Fishes of New South Wales, ed. 2, p. 4, pl. 1, fig. 6a, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java. p. 484, 1930 (New South Wales).

Heterodontus phillipi Duméril, Hist. Nat. Elasmobr., vol. 1, p. 424, 1865 (Australia).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 9, 1888 (Port Jackson, Port Hacking, Broken Bay); Handbook of Sydney, p. 117, 1898.—Waite, Mem., Australian Mus., vol. 4, p. 30, 1899 (New South Wales).—Ogilby, Mem. Queensland Mus., vol. 5, p. 82, 1916 (note).

Heterodontus phillippi Macleay, Proc. Linn. Soc. New South Wales, vol. 3, p. 309, pls. 23-24, 1879; vol. 5, p. 302, 1880 (Port Jackson, Port Phillip); vol. 6, p. 366, 1881 (Port Jackson, Port Phillip).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 44, 1890 (passim).

Cetracion philippi Cuvier, Règne animal, vol. 2, p. 129, 1817 (reference).—Lesson, Voy. *Coquille*, Zool., vol. 2, pt. 1, p. 97, pl. 2 1830 (Port Jackson; Sydney).—Agassiz, Poissons fossiles, vol. 3, p. 8, pl. D, figs. 11–16, 1935.—Gunn, Ann. Mag. Nat. Hist., vol. 1, p. 108, 1838 (Western Port, Tasmania).—Gray, Ann. Mag. Nat. Hist., vol. 1, p. 190, 1838.—Valenciennes, Règne animal Cuvier, Poissons, ed. ill., pl. 115, fig. 3 (jaws), 1839 (New Holland.)—Günther, Cat. Fishes British Mus., vol. 8, p. 415, 1870 (New Zealand, Tasmania, South Australia.)—Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 219, 1872 (Victoria).—Hector, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 80, 1872 (compiled).—McCoy, Prodromus Zool. Victoria, dec. 12, pl. 113, 1886.—Kent, Great Barrier Reef, p. 267, 1893 (Queensland)—Waite, Journ. Linn. Soc. London, vol. 25, Zool., p. 325, pl. 12, figs. 1–2 (egg), 1896.—Kent, Naturalist in Australia, p. 192, fig. 2, 1897 (Tasmania, Moreton Bay, Freemantle).

Cestraction phillipi Müller and Henle, Syst. Beschr. Plagiostomen, p. 76, 1841 (not plate) (New Holland).—Macleay, Proc. Linn. Soc. New South Wales, vol. 3, p. 309, 1879.—Kent, Naturalist in Australia, pp. 192, 194. fig., 1897 (Tasmania; Moreton Bay; Freemantle; Spring Bay).

Cestracion philippii G. Bennett, Gatherings Nat. Australasia, p. 27, fig. 1, 1860 (Port Jackson).

Cestracion phillippi Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 495, 1908 (New South Wales, Victoria, Tasmania, New Zealand?).

Centracion philippi Garman, Mem. Mus. Comp. Zool., vol. 36, p. 182, 1913 (New Holland).

Acanthias philippi Eichwald, De selachis Aristotelis zoologiae, etc., p. 67, 1819 (on Schneider).

Squalus philippinus Shaw, General zoology, vol. 5, p. 341, 1804 (on Port Jackson Shark Phillip, Voy. Gov. Phillip to Botany Bay, p. 166, pl. 42, 1789, type locality: Botany Bay).

Cestracion heterodontus Sherrard, Illustr. Official Handb. Aquar. Melbourne, pp. 42, 88, figs., 1896 (type locality: Hobson's Bay, Victoria) (not consulted).

Depth 5⅖ to 5¾ to subcaudal origin; head 4⅞ to 5, width 1¼. Snout 1⅘ to 2 in head; eye 3¾ to 5⅕, 2 to 3⅛ in snout, 2⅛ to 2⅓ in interorbital, ellipsoid; supraorbital ridges moderately high, robust, extend behind eye 1⅖ to 1½ eye diameters; dentary width 2¾ to 4 in head, mouth narrow; labial groove at mouth angle deep on lower jaw and with groove obliquely back in extent little less than groove in lower jaw or nearly equals space across mandibular symphysis; teeth anteriorly in jaws tricuspid, cusps all strong with median largest and last series large swollen molars; in young anterior teeth tridentate with median cusps largest, posteriorly teeth carinate, none as molars; nostrils level with front of upper dental plate; front nasal valve folded in nearly equilateral triangle, wide as internarial and hind valve forms rounded broad edge external of nostril; nasoral groove deep; interorbital 1⅘ to 2⅕, broadly concave. Gill openings with first largest, twice fifth and all but first above pectoral. Spiracle small, barely ⅕ of pupil, close below and just before level of hind eye edge.

Scales small, with strong triangular point and median keel, smoother on under surface of body. In young scales all appear as 4-rooted tubercle with short apical cusp.

First dorsal origin over or close behind hind basal edges of pectorals, spine 1⅘ to 2⅛ in first dorsal length which 1 to 1⅕ in head; second dorsal origin midway between ventral origin and anal origin, spine 1½ to 1⅗ in fin length, which 1⅛ to 1⅗ in head; anal origin well behind hind basal end of second dorsal, base of fin 2 to 2⅛ to subcaudal origin, length of fin 1½ to 1¾ in head; subcaudal length 1⅔ in caudal, 1 to 1⅒ in head; least depth of caudal peduncle 3⅕ to 4¾; pectoral width 1⅗ to 1⅘ its length, which longer than head to last gill opening in young or 1⅛ in head to first gill opening in adult; ventral 1⅓ to 1½; claspers pointed, not quite reaching end of inner ventral lobe of moderate sized example.

Gray-brown above, paler to whitish below. Blackish-brown band across interorbital and down over cheeks where expanded. Dark diffuse band from occiput forking just before first dorsal with oblique branch each side. Dark median interdorsal band. Young show dark predorsal band forks with branch to pectoral base and main branch reaches above ventral base. Also dark band along each side of back above and back on caudal peduncle. Fin edges mostly paler than median and basal areas.

Queensland, New South Wales, South Australia, Victoria, West Australia, Tasmania, New Zealand. Specimen from Port Jackson in the Queensland Museum.

U.S.N.M. No. 22963. Sydney, New South Wales. Australian Museum. Length, 890 mm.

U.S.N.M. No. 29017. Port Jackson. Australian Museum. Two examples, 610 and 1,000 mm., latter partly skinned out.

U.S.N.M. No. 29018. Port Jackson. Australian Museum. Head, 160 mm.

U.S.N.M. No. 39971. Port Jackson. Australian Museum. Length, 1,203 mm., skinned out.

U.S.N.M. No. 39974. Port Jackson. D. G. Stead. Length, 745 mm., partly skinned out.

U.S.N.M. No. 40006. Port Jackson. Australian Museum. Length, 458 mm.

U.S.N.M. No. 40009. Port Jackson. Australian Museum. Length, 468 mm.

U.S.N.M. No. 40012. Port Jackson. Australian Museum. Length, 223–242 mm. 2 examples.

U.S.N.M. No. 40043. Port Jackson. Australian Museum. Egg case.

U.S.N.M. No. 40044. Port Jackson. Australian Museum. Egg case.

U.S.N.M. No. 59855. Port Jackson. D. G. Stead. Length, 510 mm.

HETERODONTUS JAPONICUS Duméril

Heterodontus philippi var. *japonicus* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 424, 1865 (type locality: Japan).

Cestracion japonicus MACLAY and MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, p. 428, pl. 20, 1883 (Japan).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 61, 1897.—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 496, 1908 (Japan).

Heterodontus japonicus Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 10, 1888 (Tokio, Japan).—Steindachner, Ann. Hofmus. Wien, vol. 11, p. 223, 1896 (Kobe, Hiogo, Nagasaki).—Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 336, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, pts. 2–3, p. 38 (128), 1901 (Yokohama).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 599, 1903 (Misaki, Tokyo, Wakanoura, Kobe, Hakata, Nagasaki).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math-nat. Kl., vol. 117, pt. 1, p. 707, 1908 (Japan).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 52 (Japan).—Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 400, 1912 (Misaki).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. (Vertebrata), p. 191, 1920 (Tokyo).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 99, 1925 (Misaki; Ise coast).—Mori, Journ. Pan. Pacific Res. Inst., vol. 3, p. 3, 1928 (Mokpo, Korea).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (Japan).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 219, 1932 (Tsingtau; Chefoo; Foochow).

Centracion japonicus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 184, 1913 (Sagami Sea).—Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 3, 1931 (Misaki).—Tanaka, Jap. Fish. Life Colours, no. 7, 1933.

Centracion phillipi (not Schneider) Müller and Henle, Syst. Beschr. Plagiostomen, p. 76, pl. 31, 1841 (Japan; not New Holland example).

Cestracion philippi Schlegel, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 304, 1850 (Japan; southwest coast of Japan, Nagasaki Bay).—Günther, Cat. Fishes British Mus., vol. 8, p. 415, 1870 (Japanese specimens).—Döderlein, Arch. Naturg., vol. 49, pt. 1, p. 103, 1883 (Enoshima, Sagami Bay).

Heterodontus philippi Gray, List of the specimens of fish in the collection of the British Museum, p. 66, 1851 (Japan).

Heterodontus phillippi Brevoort, *in* Narr. Exped. China Japan, vol. 2, p. 285, pl. 12, fig. 2, 1856 (Simoda).

Heterodontus phillipi Duméril, Hist. Nat. Elasmobr., vol. 1, p. 424, 1865 (part).

Heterodontus zebra (not Gray) Bleeker, Verh. Batav. Genootsch., vol. 26, p. 127, 1857 (Nagasaki).

Heterodontus bonae-spei Ogilby, Proc. Roy. Soc. Queensland, vol. 21, p. 2, 1908 (type locality: Africa [=Table Bay, South Africa?]).—Barnard, Ann. South African Mus., vol. 21, p. 45, 1925 (note).

Depth 5⅕ to 5½ to subcaudal origin; head 3⅗ to 4⅖, width 1⅕ to 1⅓. Snout 1⅔ to 1⅞ in head; eye 4¼ to 6, 2¼ to 4 in snout, 2⅕ to 2½ in interorbital; supraorbital ridges moderately high, robust, extend about 1⅓ to 1½ eye diameters beyond eyes; dentary width 2½ to 3⅕ in head, mouth angle deep on lower jaw and with groove obliquely back in extent little less than groove on lower jaw or about equals space across mandibular symphysis; teeth anteriorly in jaws tricuspid, cusps all strong though median largest and posterior molars elongate; in young teeth quincuspid, with 3 medium cusps subequally longer, posterior teeth in young elongate and carinate, not molar-like; nostrils level with front of upper dental plate; front nasal valve folded in nearly equilateral triangle, wide as internarial and hind valve forms rounded broad margin external of nostril; nasoral groove deep; interorbital 2⅛ to 2⅓, broadly concave. Gill openings with first largest, nearly twice fifth and all but first above pectoral. Spiracle moderate, little less than pupil, close below and opposite hind edge.

Scales small, tridentate, with strong median keel and one each side; on under surface of body and fins scales often simply triangular and with median keel.

First dorsal origin over hind basal portion of pectoral spine 2⅛ to 3 in fin length which 1 in head, equals head to fifth gill opening in young; second dorsal inserted midway between hind basal end of ventral and anal origin, spine 1⅓ to 2 in fin length which 1 to 1⅗ in head; anal origin opposite hind basal end of second dorsal, base of fin 1⅕ to 1⅔ to subcaudal origin, length 1⅖ to 1½ in head; subcaudal 1⅗ to 1⅔ in caudal length, 1⅒ to 1⅖ in head; least depth of caudal peduncle 4 to 5; pectoral width 1⅗ to 1¾ in its length, which equals head to fifth gill opening, though much longer in young; ventral 1⅓ to 1⅔ in head; claspers of medium sized examples not reaching beyond ventrals.

Russet brown largely, with darker cloudings on head and snout. Under surface of body whitish. Often about 8 to 10 darker obscurely defined or diffuse transverse bands over head, back and tail. Intervening paler areas also with narrow dark bands, often variable or broken as blotches and spots. Fins clouded darker on terminal portions.

Japan, Korea, China, East Africa. Garman's distinction of the "base of anal about one and one fourth times its length from that of caudal" will not hold, as my smaller examples show 1⅕ to 1⅔.

U.S.N.M. No. 37982. East Africa. N. M. Ferebee. Length, 457 mm. This example is of exceptional interest in view of its remote geographical location. On comparison with the other Japanese specimens there is no question of its identity. Its supraorbital ridges and coloration are entirely similar; moreover the length of the anal is contained 1½ times in the space to the subcaudal origin. In view of this determination it is quite possible that *Heterodontus bonae spei* Ogilby may pertain to the present species rather than to *Heterodontus philippi* with which Barnard seems to think it may belong. The type of *Heterodontus bonae spei* in the Queensland Museum, No. 1.1587, jaws only, from Table Bay, South Africa.

U.S.N.M. No. 22609. Awa, Japan. Japanese Government. Length, 525 mm.

U.S.N.M. No. 38839. Japan (?). P. L. Jouy. Length, 380 mm.

U.S.N.M. No. 39889. Japan. Prof. E. S. Morse. Length, 195–388 mm. 1878. 2 examples.

U.S.N.M. No. 50730. Misaki, Sagami. Jordan and Snyder. Length, 317 mm.

U.S.N.M. No. 51292. Tokyo. Jordan and Snyder. Length, 495 mm.

U.S.N.M. No. 71764. Misaki. *Albatross* collection, 1906. Length, 305 mm.

U.S.N.M. No. 71831. Tokyo market. *Albatross* collection, 1906. Length, 394 mm.

U.S.N.M. No. 75954. "Japan." P. L. Jouy. Length, 563 mm.

U.S.N.M. No. 86004. Foochow, China. A. de C. Sowerby.

HETERODONTUS GALEATUS (Günther)

Cestracion galeatus GÜNTHER, Cat. Fishes Brit. Mus., vol. 8, p. 416, 1870 (type locality: Australia [= New South Wales]).

Heterodontus galeatus MACLEAY, Proc. Linn. Soc. New South Wales, vol. 3, p. 313, pl. 25, 1879 (Rose Bay, Port Jackson).—RAMSAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 97, 1880 (Port Jackson).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 302, 1880 (Port Jackson); vol. 6, p. 366, 1881 (Port Jackson).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 10, pl. 1, fig. 1 (jaws), 1888 (Port Jackson and Port Stephens).—WAITE, Prelim. Rep. *Thetis* Exped., p. 39, 1898 (egg case at Wollongong and Kiama).—STEAD, Fishes of Australia, p. 232, 1908.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (reference).

Gyropleurodus galeatus OGILBY, Handbook of Sydney, p. 117, 1898.—WAITE, Mem., Australian Mus., vol. 4, p. 31, 1899 (egg cases at Wollongong and Kiama).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 495, 1908 (New South Wales).—MCCULLOCH, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 3, 1911 (off Port Stephens, New South Wales, in 43 fathoms).—OGILBY, Mem. Queensland Mus., vol. 5, p. 82, 1916 (Tweed Heads and Byron Bay).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 127, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 5, pl. 1, fig. 7a, 1927.

Centracion galeatus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 185, 1913 (New South Wales).

Molochophrys galeatus WHITLEY, Australian Zool., vol. 6, p. 310, 1931; Mem. Queensland Mus., vol. 10, pt. 4, pp. 182, 197, pl. 27, fig. B, 1934 (off Sandon Bluff, New South Wales).

Depth 4½ to 5⅘ to subcaudal origin; head 3⅔ to 5, width 1¼ to to 1⅓. Snout 1¾ to 2 in head; eye 4 to 6, 3 to 3¼ in snout, 2⅔ to 3 in interorbital, ellipsoid; supraorbital ridges well elevated, expanded outward to overhang orbits, ends abruptly about eye diameter behind eye; dentary width 2⅗ to 3⅖ in head; labial groove at mouth angle deep on lower jaw though without long oblique groove backward; lower lip over mandibular symphysis less in width than labial groove of lower jaw; teeth in front of jaws broadly triangular, tricuspid, large median cusp much greater than small basal lateral cusp each side and posterior molars; in young teeth quincuspid, compressed, median cusps largest though all short; posterior teeth carinate and carinae with small cusps, none molar; nostrils level with front of upper dental plate; front nasal valve folded in broad triangular lobe but little less in width than internarial and hind valve forms rounded broad edge external of nostrils, nasoral groove deep; interorbital 1¾ to 2, deeply concave. Gill openings with first largest, twice fifth and all but first above pectoral base. Spiracle very small, barely ⅛ of pupil, close below and opposite hind orbital edge.

Scales appear as quadrate tubercles, with 4 roots and capped by short cusp or spine.

First dorsal origin above or close behind hind basal edges of pectorals, spine 1⅗ to 2½ in fin length which 1⅛ in head or equals head to fifth gill opening in young, hind basal lobe triangular; second dorsal origin midway between ventral and anal origin, spine 1⅖ to 2 in fin length, which 1 to 1¼ in head; anal origin well behind hind basal end of second dorsal, base of fin 1 to 1⅛ in space to subcaudal origin, length of fin 1⅓ to 1½ in head; subcaudal lobe 1½ to 1⅗ in caudal length, 1 to 1⅛ in head; least depth of caudal peduncle 3 to 5; pectoral width 1⅗ to 1¾ in its length, which greater than head to fifth gill opening, about equals head to fourth gill opening in adult; ventral 1¼ to 1⅖ in head; claspers little longer than ventral, extend well behind hind ventral edges, pointed and with coriaceous point.

Brown above, below whitish. Transverse dusky brown band across orbits over occiput to spinous dorsal, extends below eye widening on cheek. Transverse dark band before and another behind ventrals. Lesser bands before first dorsal, one before second dorsal and another over anal. Vertical fins and upper surfaces of paired fins brown, edges of all fins narrowly uniform whitish.

New South Wales. A well-marked species, easily known by the high flaring supraorbital ridges, appearing as crests abruptly terminating behind eyes. Specimens in the Queensland Museum from Port Jackson and the Queensland coast.

U.S.N.M. No. 40001. Port Jackson. Australian Museum. Length, 600 mm.
U.S.N.M. No. 40005. Port Jackson. Australian Museum. Length, 517 mm.
U.S.N.M. No. 40013. Port Jackson. Australian Museum. Length, 182 mm.
U.S.N.M. No. 40017. Port Jackson. Australian Museum. Length, 357 mm.
U.S.N.M. No. 59876. Port Jackson. D. G. Stead. Length, 358 mm.

Subgenus WUIA Fowler

Anal base 2 or more times its length from subcaudal origin. Dark transverse body bands narrow.

HETERODONTUS ZEBRA (Gray)

Centracion zebra GRAY, Zool. Misc., p. 5, 1831 (type locality: Sea of China).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 181, 1913 (China).

Cestracion zebra RICHARDSON, Rep. Brit. Assoc. Adv. Sci. for 1845, 15th meeting, p. 195, 1846 (seas of China).—BLEEKER, Verh. Batav. Genootsch., vol. 25, p. 21, 1853 (Nagasaki; China); Act. Soc. Sci. Indo-Néerl., vol. 1, p. 8, 1856 (Amboina); p. 7, 1857–1858 (Japan).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 496, 1908 (China).

Heterodontus zebra GRAY, Cat. Fishes British Mus., p. 65, 1854 (China).—BLEEKER, Act. Soc. Sci. Indo-Néerl., vol. 1, no. 3, p. 6, 1856 (Manado); vol. 1, no. 5, p. 71, 1856 (Amboina, Nagasaki, Manado); Verh. Batav. Genootsch., vol. 26 (Japan), pp. 6, 127, 1857 (Nagasaki).—MACLAY and MACLEAY, Proc. Linn. Soc. New South Wales, vol. 10, p. 673, pl. 45, 1886 (Swatow).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 10, 1888 (open sea off Swatow).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 99, 1925 (Osaka market).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, no. 4, p. 2, fig. 1, 1929 (Amoy).—FOWLER, Hong Kong Nat., vol. 1, p. 29, fig. 2, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (reference).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 88, 1933 (Yenting; Chusan).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 233, 1934 (name).

Cestracion phillipi var. *zebra* MARTENS, Preuss. Exped. Ost-Asien, vol 1, p. 409, 1876 (Nagasaki).

Heterodontus phillipi (not Schneider) DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 424, 1865 (part).

Cestracion philippii PETERS, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).

Centracion philippi GARMAN, Mem. Mus. Comp. Zool., vol. 36, pl. 47, figs. 4-6 (jaws), 1913.

Cestracion amboinensis REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 436, 1906 (type locality: Amboyna); ser. 8, vol. 1, p. 497, 1908 (type).

Depth 5 to subcaudal origin; head 5. Snout 1⅞ in head; eye 4¼, 2 in snout; mouth narrow; both jaws with labial folds, upper very short or not halfway to narial valves and with short groove behind mouth angles, lower folds long as separating interspace; teeth quincuspid in young, tricuspid with development of molars, which elongate with longitudinal keel, more swollen with age; supraorbital ridge low. Gill openings gradually smaller to last, which ⅓ of first or little over half of eye, above pectoral base.

First dorsal origin above middle of pectoral base, fin length 3½ in body length to subcaudal origin; second dorsal origin behind ventral ends, about long as head; anal inserted about opposite last basal third of second dorsal, fin length 1¼ in head; pectoral length 3⅖ to lower caudal lobe origin, width 1¾ its length; ventral 1⅕ in head; caudal 3¼ in rest of body, front subcaudal edge 1¼ in head.

Light yellowish to reddish brown, darker on back, lighter in young. Transverse dark bands, alternating wider and narrower, or wider split into pair of which lower ends more or less curved and united. V-shaped band on snout, then straight bar separating it from orbital pair, portions below eye each again divided. Second pair of bars on nape, third pair before dorsal spine, fourth behind first dorsal, fifth before and sixth and seventh behind second dorsal, eighth at caudal origin and others on caudal fin. Length, 550 mm. (Garman; Wu.)

East Indies, China, Japan. According to Regan reaches 780 mm.

Family SCYLIORHINIDAE

Body elongate. Tail not keeled or bent up. Pupil of eye oblique, slit sloping down and forward. No nictitating membrane. Mouth usually wide, without grooves to nostrils. Teeth small or moderate, several series functional, small, with median cusp and 1 to 4 on each side. Gill openings 5. Spiracle distinct. Head with numerous mucous pores, especially on snout below. Two spineless dorsals, subequal, first above ventrals. Anal mostly before second dorsal. Caudal long, usually with basal lobe.

A large family of small sharks found in all temperate and tropical seas, some ranging into deep water. Many live at or near the bottom, feeding on crustaceans, worms, and mollusks. Others are known to be nocturnal, living or hiding in marine vegetation or the wastes of sponges, gorgonians, etc., in the day and feeding by night. All, so far as known, appear to be viviparous. Their egg cases are large, usually quadrate, often with prehensile horns or tendrils at each corner which become attached to seaweeds, rocks, or floating debris.

The uncertain *Caninoa* Nardo has been suggested as much like *Pentanchus*. Döderlein[1] placed it as a doubtful *Notidamus* (=*Hexanchus*); Canestrini, 1872, suspected the gill openings may have been wrongly counted, and Ninni in the same year suggested it may have been *Odontaspis ferox* Agassiz in which the first dorsal was mutilated. Nardo, however, in commenting on its peculiar characters erected the subfamily Caninoini for it, as follows: Teeth equal, triangular, acute, denticulate at base, obtuse toward mouth angles. Gill openings 5. No spiracle. One dorsal. Anal present.

Genus CANINOA Nardo

Caninoa NARDO, Atti Riunione Sci. Ital., 1841, p. 312. (Type, *Caninoa chiereghini* Nardo=*Squalus barbarus* (Chiereghini) Nardo, monotypic.)

Thalassoklephetes GISTEL, Naturg. Thierreichs, p. VIII, 1848. (Type, *Caninoa chiereghini* Nardo, virtually. *Thalassoklephetes* Gistel proposed to replace *Caninoa* Nardo.)

CANINOA CHIEREGHINI Nardo

Caninoa chiereghini NARDO, Atti Riunione Sci. Ital., 1841, p. 312 (on *Squalus barbarus* Chiereghini).

Squalus barbarus (Chiereghini) NARDO, Atti Riunione Sci. Ital., 1841, p. 312 (on Chiereghini, Descr. Pesci Venez., 1818, sp. 12, fig. 49♀, MSS.; type locality: Venice).

Body rather elongate, rounded, somewhat curved above, swollen below; tapering gradually to tail; head 8 in total length, small, somewhat flattened vertically. Snout short, obtuse, rounded at tip; eye convex, oblong, placed between snout tip and mouth; teeth triangular, long, very acute, sharp, minutely denticulate near base; followed at mouth angles by other round teeth, somewhat truncate, equal in both jaws. Gill openings 5, lateral, long, linear. Spiracle absent? Mouth very large, arched.

Skin minutely tuberculate, rough to touch.

Dorsal single ??, inserted vertically in interspace between ventrals and anal; caudal falciform, with upper lobe somewhat longer than lower; pectoral long, falcate.

Color dark, tending somewhat reddish brown, clearer below, silvery. Length, ? (Döderlein.)

The following egg cases probably pertain to species of this family, though at present unidentifiable:

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[1] Manuale ittiologico del Mediterraneo, pt. 2, fasc. 1, p. 82, 1881.

D.5123. Malabrigo Light, N. 44° W., 32.50 miles (lat. 13°12′45″ N., long. 121°38′45″ E.). East coast of Mindoro. February 2, 1908. 8 egg cases with tendrils.

D.5504. Macabalan Point Light (Mindanao), S. 39° E., 6 miles (lat. 8°35′30″ N., long. 124°36′ E.). August 5, 1909. 9 egg cases 55 to 60 mm. long excluding tendrils.

D.4443. Egg cases 70 mm long exclusive of short tendrils.

ANALYSIS OF GENERA

a^1. Galeinae. First dorsal origin not before ventrals.
b^1. Upper caudal edge with modified scaly armature.
c^1. Snout elongate, depressed-- **Galeus**
c^2. Snout short, thick-- **Parmaturus**
b^2. Upper caudal edge without modified scaly armature.
d^1. Belly capable of great inflation; labial folds absent or rudimentary; hind nasal valves present------------------------ **Cephaloscyllium**
d^2. Belly not inflatable.
e^1. Labial folds absent or on lower jaw only, none on upper.
f^1. Front nasal valves without or with rudimentary cirrus. **Scyliorhinus**
f^2. Front nasal valves without cirrus------------------- **Poroderma**
e^2. Labial folds around mouth angle.
g^1. Hind nasal valve present; snout short; anal and subcaudal short. **Halaelurus**
g^2. Hind nasal valve rudimentary, anterior not reaching mouth; anal and subcaudal elongate; dorsals small, sometimes first absent-- **Pentanchus**
g^3. Hind nasal valves absent, anterior reaching mouth; anal and subcaudal short.
h^1. Snout narrow, short; fold below eye-------- **Atelomycterus**
h^2. Snout broader, short, depressed; no fold below eye; anal larger than dorsals---------------------- **Haploblepharus**
a^2. Proscylliinae. First dorsal origin before ventral origin; labial folds short, upper larger; anal long, distant from subcaudal----------- **Proscyllium**

Genus GALEUS Rafinesque

Galeus Rafinesque, Caratteri animali piante Sicilia, p. 13, 1810. (Type, *Galeus melastomus* Rafinesque, designated by Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 53.)

Pristiurus Bonaparte, Giorn. Arcad., vol. 49, p. 52, 1831 (fossil); Icon. Fauna Ital. Pesci, vol. 3, pt. 7, no pagination, 1834. (Type, *Galeus melastomus* Rafinesque, monotypic.)

Pristidurus Agassiz, Recherches poiss. fossiles, vol. 3, p. 85, 1838.—Bonaparte, Mém. Soc. Sci. Nat. Neuchâtel, vol. 2, p. 11, 1839. (Type, *Galeus melastomus* Rafinesque. Emendation.)

Figaro Whitley, Rec. Australian Mus., vol. 16, no. 4, p. 238, 1928. (Type, *Pristiurus* (*Figaro*) *boardmani* Whitley, orthotypic.)

Body cavity less than half total length. Snout elongate, covered with thick cellular tissues secreting within gelatinous substance, escaping by numerous pores in skin. Eye large, lower lid with fold.

Mouth large, with labial folds around angles on both jaws. Teeth small, cusps 3 to 7, median strongest. Nostrils separated from one another by broad isthmus, no groove to mouth, inferior; front valves without cirri; hind valves short, not extended backward. Gill openings small, last above pectoral base. Spiracle small, close behind eye. Scales fine. Series of small flat spines on each side of upper caudal edge above sensory area. Dorsals 2, small, first fin above or behind ventral. Anal little before second dorsal. Caudal axis not elevated. Subcaudal rather large. Muscular portions of pectoral bases closely enveloped by muscles of body.

Small sharks, usually found in moderate depths. The egg capsules are often more or less rounded at one end and the horns very short at the other. They are said to be deposited in pairs, or two at one time.

Besides the species noticed below two others are extralimital:

GALEUS JENSENI (Saemundsson)

Pristiurus jenseni Saemundsson, Vid. Medd. Nat. Forh. Kjöbenhavn, vol. 74, p. 169, pl. 4, fig. 1, pl. 5, fig. 3, 1923 (type locality: Iceland).

GALEUS MELASTOMUS Rafinesque

Galeus melastomus Rafinesque, Caratteri animali piante Sicilia, p. 13, 1810 (type locality: Sicily).—Fowler, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 40, fig. 8, 1936 (Madeira; Morocco; Mediterranean; Norway).

ANALYSIS OF SPECIES

a^1. Galeus. Upper edge of caudal peduncle and caudal fin armed with enlarged denticles.
- b^1. Body variegated with indistinct cloudings---------------------- eastmani
- b^2. Body largely uniform, except row of white points along lateral line. hertwigi
- b^3. Body largely uniform; fins mostly with dusky or blackish terminally. sauteri

a^2. Figaro. Upper and lower edges of caudal peduncle, as well as upper caudal edge, armed with enlarged denticles; dark cross bands on upper half of body-- boardmani

Subgenus Galeus Rafinesque

GALEUS EASTMANI (Jordan and Snyder)

Pristiurus eastmani Jordan and Snyder, Smithsonian Misc. Coll., vol. 45, p. 230, pl. 60, 1904 (type locality: Off Idzu, Japan).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 464, 1908 (Japan).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 93, 1913 (Idzu Sea, Japan).

Galeus eastmani Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (reference).

Depth 7⅓ to subcaudal origin; head 4⅔. Snout 2⅕ in head; rather acutely pointed; eye 4, 1⅞ in snout; mouth width equals snout, preoral length equals space between eye center and first gill opening or interorbital width; teeth with 7 acute, pointed cusps, central twice high as others; lateral cusps graduated smaller toward outer edges of tooth; nostrils with pointed marginal flaps, meet and curve inward so nasal cavity tubelike with outer and posterior opening; internarial between outer anterior nasal openings equals mouth cleft along upper jaw or space between front eye edge and spiracle; internarial between posterior nasal openings equals half horizontal eye diameter. Gill openings equidistant, fifth shortest and above pectoral base. Spiracle level with and close behind eye, its width equals its distance behind eye.

Scales trilobed, minute, each with central keel. Upper edge of tail with keel beginning eye diameter behind second dorsal base and extends posteriorly space somewhat greater than head; keel armed by 2 rows of enlarged, toothlike scales like those on body between rows of larger ones.

First dorsal origin about opposite last ⅖ of ventral base, front fin edge 1⅗ in head; second dorsal inserted over last ⅖ in anal length, front fin edge 1⅘ in head; anal length equals head, front fin edge 2⅓; caudal 2¾ in rest of body, subcaudal trifle higher than anal, with notch little before last fifth; pectoral obtuse, reaches 1¾ to ventral, width 1⅓ its length which 1⅓ in head; ventral length 1½.

Brownish above, with indistinct deeper clouding, more conspicuous above and little behind pectoral base, midway between pectoral and ventral, below dorsal bases, on upper edge of tail and on caudal. Tongue and inside mouth without dusky. Dorsals dusky, front edges dark brown. Free edges of dorsals and anal white. Front caudal, anal and pectoral edges dark brown. Pectorals dusky above, free edges white. Length, 345 mm. (Jordan and Snyder.)

Japan. The type a female, in Stanford University.

GALEUS HERTWIGI (Engelhardt)

Pristiurus hertwigi ENGELHARDT, Zool. Anz., vol. 39, p. 644, 1912 (type locality: Yokohama and Asburatsubo).

Galeus hertwigi FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (reference).

Snout short, from front eye edge less than interorbital; preoral length less than mouth width.

Upper surface of body rough, scales moderately large, prominent, each with median point longest.

Dorsals equally large, each long as base length, rounded; second dorsal reaches over and beyond beginning of marginal caudal denticles; anal distant from subcaudal origin ⅓ its basal length; pectoral short, reaches less than halfway to ventral; ventral short, broad.

Back clear gray-brown. Belly yellowish white. On tail colors sharply contrasted. Row of whitish points along lateral line. Anal with brownish basal streak. Length, 660 mm. (Engelhardt.)

Japan. Described from 5 examples in the Münich Museum.

GALEUS SAUTERI (Jordan and Richardson)

Pristiurus sauteri JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 160, pl. 63, fig. 1, 1909 (type locality: Takao, Formosa).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 94, 1913 (Formosa).

Galeus sauteri FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (reference).

Depth 6½ to subcaudal origin; head 4⅖. Snout 2⅓ in head; eye 4⅓, 2 in snout; mouth width slightly greater than snout length, about equals interorbital; teeth with long median cusp, each side another cusp about half as long and each short cusp with or without 1 or 2 rudimentary basal cusps; nostril width equals internarial, equals twice space from inner nasal angle and mouth; interorbital little elevated. Gill openings equidistant, above pectoral base. Spiracle directly behind eye, distant slightly less their diameter.

Scales minute, with strong central cusp with median keel, small rudimentary cusp each side. Upper tail edge with low keel begins little less than 2 eye diameters behind second dorsal and extends back to merge into upper caudal lobe; keel armed each side with row of enlarged scales, between which 4 rows of ordinary scales.

First dorsal origin over last third of ventral length, front fin edge 2 in head; second dorsal origin over middle of anal length, front fin edge 2 in head; anal length 1⅕, front fin edge 2⅔, lower than subcaudal; caudal length 2⅖ in rest of body, subcaudal with front edge 1½ in edge with notch before last fourth in its length; pectoral reaches 1⅗ to ventral, width 1⅖ its length which 1⅓ in head; ventral length 1$\frac{1}{10}$; claspers rather robust.

Uniform brownish on back and upper part of sides, paler below. Dorsals black on upper front half, white on posterior third. Upper caudal lobe with broad blackish margin. Pectorals dark brownish anteriorly above, whitish behind and on free margin. Ventrals and anal with rather indistinct pale margins. Length, 305 to 355 mm. (Jordan and Richardson.)

Formosa. Described from 6 specimens in the Carnegie Museum.

Subgenus FIGARO Whitley

GALEUS BOARDMANI (Whitley)

Pristiurus (*Figaro*) *boardmani* WHITLEY, Rec. Australian Mus., vol. 16, No. 4, p. 238, pl. 18, fig. 3, 1928 (type locality: Off Montague Island, New South Wales).

Figaro boardmani WHITLEY, Australian Zoologist, vol. 5, p. 354, 1929 (reference); Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934. (reference).

Depth 7 to subcaudal origin; head 5⅓. Snout 2⅕ in head; eye 3¾, 1⅘ in snout; preoral 2⅙, front tip of mandible slightly in advance of front eye edge, short upper and lower labial folds about equal half pupil diameter; nostril little nearer eye than snout tip; interorbital but little elevated. Gill openings graduated smaller from first, which equals half of eye and last above pectoral base. Spiracle close behind eye, less than pupil.

Long caudal peduncle with enlarged denticles on its lower as well as its upper median surface, latter extending whole length of upper caudal edge.

First dorsal inserted before middle of body, over hind basal ventral edge, its front edge 1¾ in head; second dorsal origin over last third in anal length, front edge of fin 1⅖ in head; anal origin midway between ventral and subcaudal origins; caudal 3⅖ in rest of body, subcaudal about equally high as anal, and notched at last 2/7 its length; pectoral 1½ in head, deep as long, hind edge nearly truncate and reaching halfway to ventral; ventral length 1¼ in head; clasper moderate, pointed.

Body with brownish cross bands, which cross upper half of body and tail and interspersed with lighter brown areas on light gray ground color. No black margins to fins. Length, 540 mm. (Whitley.)

New South Wales. Known from the type and two other specimens in the Australian Museum.

Genus PARMATURUS Garman

Parmaturus Garman, Bull. Mus. Comp. Zool., vol. 46, p. 203, 1906. (Type, *Parmaturus pilosus* Garman, designated by Jordan, Genera of Fishes, pt. 4, p. 518, 1920.)

Body rounded, nearly long as tail. Head wide. Snout short, thick, very vascular. Eye large. Nostrils large, without grooves to mouth; front valve short, widely separated across internarial space, without cirrus; hind valve short. Upper caudal edge with modified scales, somewhat as in *Galeus*, otherwise appearance more like *Scyliorhinus*. Dorsals small, first above ventrals, second above anal.

PARMATURUS PILOSUS Garman

Parmaturus pilosus Garman, Bull. Mus. Comp. Zool., vol. 46, p. 204, 1906 (type locality: lat. 34° 59′ N., long. 139° 31′ E., in 430 fathoms, Japan).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 464, 1908 (reference, note).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 89, pl. 8, figs. 1–5, 1913 (type).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (reference).

Depth 6 to subcaudal origin; head 4⅔, width 1⅖. Snout 2⅘ in head; orbit 3⅖, 1¼ in snout; preoral equals snout; mouth width 2 in head, length 2½ its width; labial folds short, equal, around mouth

corners; teeth compressed, asymmetrical, cusps 5 to 9, upper usually with 6 of which fourth from inner edge largest, lower commonly with 5 with third largest; nostrils large, equal internarial, front valve short with well-developed rounded lobe crossing nasal cavity medianly, widely separated from one another; hind valve not continuous with front one around inner edge of nostril; interorbital convex. Spiracle small, close behind eye, width equals space from orbit.

Scales minute, nearly erect, slightly bent backward, with strong median cusp and each side basally much smaller one; appearance velvety; upper caudal edge $\frac{3}{5}$ its length with 2 series of enlarged scales separated by 4 series of small ones forming rather broad armature, immediately below each edge narrow space free from scales probably sensory or luminous.

First dorsal origin slightly behind ventral origin, front edge $1\frac{3}{5}$ in head; second dorsal origin over first third in anal length, front edge $1\frac{3}{5}$ in head; anal length $1\frac{1}{5}$, front edge $1\frac{4}{5}$; caudal $2\frac{2}{3}$ in rest of body, subcaudal lower than anal, notch near last fourth in fin; pectoral reaches $2\frac{2}{5}$ to ventral, width $1\frac{2}{5}$ its length, which $1\frac{1}{2}$ in head; ventral length $1\frac{3}{5}$.

Above warm brown, below lighter. Inside mouth and throat dark. Fins darker than body, blackish terminally. Length, 430 mm. (Garman.)

Japan. Known only from the type, Mus. Comp. Zool. No. 1107.

Genus CEPHALOSCYLLIUM Gill

Cephaloscyllium Gill, Ann. Lyceum Nat. Hist. New York, vol. 7, pp. 407, 408, 1862. (Type, *Scyllium laticeps* Duméril, orthotypic.)

Body robust, longer than tail. Head wide, depressed. Snout short, blunt, narrowing rapidly forward. Eye lateral, orbit elongate, lower lid included by upper in closing. Mouth wide, greatly arched, distensible, labial folds rudimentary. Teeth small, numerous, with 3 to 5 cusps, median cusp longest. Nostrils widely separated, near lip, nearer to snout end than to mouth angles; no groove to mouth, valves not extended on internarial space, without cirri, posterior short and joined to anterior at inner ends. Last gill opening above pectoral. Spiracle behind eye. First dorsal behind ventral origins. Second dorsal smaller than first, smaller than anal.

Eastern Pacific to Japan, Australia, and New Zealand.

ANALYSIS OF SPECIES

a^1. Body variegated with dark bands or blotches and dark or ruddy transverse bands.
    b^1. Pectoral reaches $\frac{2}{3}$ to ventral________________________________ **isabellum**
    b^2. Pectoral reaches not quite halfway to ventral________________ **umbratile**
a^2. Uniform grayish; pectoral reaches less than halfway to ventral___ **sufflans**

CEPHALOSCYLLIUM ISABELLUM (Bonnaterre)

Squalus isabella BONNATERRE, Tableau encyclop. Ichth., p. 6, 1788 (type locality: La mer du sud).—WALBAUM, Artedi Pisc., vol. 3, p. 514, 1792 (on Broussonet).—DONNDORF, Zoologische Beiträge zur 13 ten Ausgabe . . . , vol. 3, p. 836, 1798.—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 255, 1798 (on Gmelin).—SCHNEIDER, Syst. Ichth. Bloch, p. 127, 1801 (New Zealand).

Squalus sabella GMELIN, Syst. Nat. Linn., vol. 1, p. 1489, 1789.

Scyliorhinus isabellus BLAINVILLE, Bull. Soc. Philom. Paris, 1816, p. 121 (name only).

Cephaloscyllium sabella WAITE, Trans. New Zealand Inst., vol. 43, p. 384, 1910 (note on name).—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 6, nos. 5–6, p. 264, fig. 8, 1924 (off Hokitika).

Cephaloscyllium isabella MCCULLOCH, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 6, 1911 (off Flinders Island, Bass Strait).

Cephaloscyllium isabellum GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 79, 1913 (Australia, New Zealand).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (reference).

Cephaloscyllum isabella WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 98, 1934 (reference) (error).

Cephaliscyllium isabella isabella WHITLEY, Rec. Australian Mus., vol. 18, p. 324, 1932 (New Zealand).

Scyllium laticeps DUMÉRIL, Rev. Mag. Zool., ser. 2, vol. 5, p. 84, pl. 3, fig. 2, 1853 (head) [type locality: Coasts of New Holland (Verreaux)]; Hist. Nat. Elasmobr., vol. 1, p. 323, 1865 (type).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 404, 1870 (Tasmania).—HECTOR, *in* Hutton and Hector, Fishes of New Zealand, p. 79, 1872 (Dusky Bay).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 297, 1880 (Tasmania); vol. 6, p. 361, 1881 (Tasmania).

Catulus laticeps JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 38, 1901 (Nagasaki).

Scyliorhinus laticeps REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 458, 1908 (South Australia, Tasmania, New Zealand).

Cephaloscyllium laticeps WAITE, Rec. Canterbury Mus., vol. 1, no. 2, p. 6, pl. 14, fig. 1, pl. 21, fig. 1, 1909 (egg case) (Molyneux Bay to Bay of Plenty, 13 to 94 fathoms).—YOUNG, Trans. New Zealand Inst., vol. 60, p. 139, 1929 (Chatham Island).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Cephaloscyllium isabella laticeps WHITLEY, Rec. Australian Mus., vol. 18, p. 322, fig. 2, 1932 (Derwent River, Tasmania).

Scyllium? lima RICHARDSON, Rep. British Assoc. Adv. Sci. for 1842, p. 29, 1843 (type locality: Eaheenomauwee, New Zealand) (on *Squalus lima* Parkinson, Ms.).

Cephaloscyllium indicum (not Gmelin) JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 128, 1901 (reference).

Cephaloscyllium laticeps forma *nascione* WHITLEY, Rec. Australian Mus., vol. 18, No. 6, p. 324, fig. 2, 1932 (type locality: Trawled in 90 fathoms, 24 miles NNE. of Montague Island, New South Wales).

Depth 6½ to subcaudal origin; head 4¾, wide as long. Snout 3 in head; eye 10, 3⅓ in snout, on upper surface of head but directed laterally; mouth very large, without distinct labial fold; teeth alike in jaws, small, bases broad, cusps 3 with laterals small; 6 rows of teeth functional, 70 rows above, 60 below; nostrils close to snout edge, widely separated, besides front valve hind edge also with lobe of skin. Gill openings graduated smaller posteriorly, last 2 over pectoral base.

Scales very rough, especially on back where prickles large; on under surface of tail not enlarged; row of isolated large scales arises on each side of occipital region and extends to second dorsal.

First dorsal inserted little behind midlength over middle of ventrals, front edge 1¾ in head; front edge of second dorsal 2⅔; anal little larger and opposite second dorsal, front edge 2⅖; caudal 3⅔ in rest of body, subcaudal little higher than anal; pectoral equals head to second gill opening, width 1½ its length; ventral length 1⅓ in head to first gill opening.

Brown above, white below. Upper parts with black transverse blotches disposed alternately wider and narrower; wide bands on occiput, predorsal, below both dorsals and one at base and another towards middle of caudal lobe. Black mark below eye, another below occipital patch and connected with first narrow band, others along sides of body. In young patches occur also on ventrals and on anal and lower caudal lobe, but all markings become confused with age and tend to break up into spots. Length, 1,010 mm. (Waite.)

South Australia, Tasmania, New Zealand, Chatham Island. Waite says: "When taken from the net the carpet-sharks were of relatively enormous girth, due to the inflation of the stomach with water. When the abdomen was pierced with a penknife blade a jet of water spurted out to a distance of several feet, due to the elasticity of the stomach. This inflation is common to members of the genus, and the American and Japanese species are described as inflating their stomachs with air, when they float belly upwards."

CEPHALOSCYLLIUM UMBRATILE Jordan and Fowler

Cephaloscyllium umbratile JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 602, fig. 1, 1903 (type locality: Nagasaki).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 80, 1913 (Japan).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. (Vertebrata), p. 191, 1920 (Tokyo).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (type).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 221, fig. 3, 1932 (Tsingtau).

Scyliorhinus umbratilis REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 459, 1908 (Japan).

Cephaloscyllium laticeps (not Duméril) NYSTRÖM, Svenska Vet. Akad Handl., vol. 13, pt. 4, p. 49, 1887 (Nagasaki).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 62, 1897.

Depth 6⅓ to subcaudal origin; head 5, width little less than length. Snout 2⅖ in head; eye 5⅖, 2 in snout, 3⅓ in interorbital; mouth large, rather broad, width 2 in head; teeth small, numerous, tricuspid; nostrils nearer snout tip than eye, not confluent with mouth; interorbital 2, broad, flat. Gill openings equidistant, last smallest, last 2 above pectoral base.

Scales small, rough.

First dorsal larger than second, inserted over middle of ventrals, front edge 1½ in head; front edge of second dorsal 2⅓; anal origin little before second dorsal origin, fin little larger, front fin edge 2 in head; caudal 4⅓ in rest of body, subcaudal little higher than anal; pectoral 1¼ in head, width 1⅖ its length; ventral length 1¾ in head; claspers moderate.

Pale brown, very light below. Above marbled with darker or deeper brown. Back with 5 pale ruddy brown cross bars; with blotches of darker brown, first behind eye, next over pectoral base, third between last named and first dorsal, also one at second dorsal; on caudal 2 broad cross bars, one at caudal base and other near its tip. Length, 989 mm. (Jordan and Fowler.)

Japan. The type, a dried skin, in Stanford University. Garman describes an example 1,002 mm. with 118 rows of upper teeth and 124 lower rows. I cannot agree with Schmidt that it is "probable" that the present species is synonymous with *Catulus torazame* Tanaka. The different proportions and arrangement of the fins, besides the greatly smaller pectorals, at once separate the present species.

CEPHALOSCYLLIUM SUFFLANS (Regan)

Scyliorhinus (*Cephaloscyllium*) *sufflans* Regan, Ann. Mag. Nat. Hist., ser. 9, vol. 7, p. 413, 1921 (type locality: Natal).

Scylliorhinus sufflans Gilchrist, Marine Biol. Surv. South Africa, Spec. Rep. No. 2, pt. 3, p. 46, 1922 (Natal, in 160 to 175 fathoms).—Barnard, Ann. South African Mus., vol. 21, p. 41, 1925 (Natal, in 120 to 175 fathoms).

Cephaloscyllium sufflans Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 362, fig. 2–3, 1935 (Natal, 70 to 80 fathoms).

Snout obtusely pointed, its preoral length ½ space between outer edges of nasal flaps; mouth twice as wide as long; no labial folds; nasal flaps without cirri, internarial space 1½ length of posterior edge of either and 5 times their distance from edge of lip. Gill openings subequal, last 2 closer together than others.

First dorsal inserted over middle of ventrals, front angle rounded, posterior obtuse, base 1⅓ that of second dorsal and equal to its distance from that fin, which ends nearly above anal end; anal base nearly above anal end; anal base nearly equals first dorsal base, longer than its distance from caudal; pectoral angles rounded, reaches not quite half way to ventrals.

Grayish, without distinct spots or markings. Length, 750 mm. (Regan.)

Off Natal, South Africa.

Genus SCYLIORHINUS Blainville

Scyliorhinus Blainville, Bull. Soc. Philom. Paris, 1816, p. 121. (Type, *Squalus canicula* Linnaeus, designated by Gill, Ann. Lyceum Nat. Hist. New York, vol. 7, p. 407, 1862.)

Scylliorhinus Blainville, Faune Française, Poissons, p. 68, 1825. (Type, *Squalus catulus* Linnaeus.)

Catulus (not Kniphof, 1759, in Insects) Valmont, Dict. Hist. Nat. Paris, vol. 10, p. 114, 1769; vol. 12, p. 421, 1769. [Type, *Catulus vulgaris* Valmont= *Squalus canicula* Linnaeus, monotypic (inadmissible).]—Andrew Smith, Proc. Zool. Soc. London, 1837, p. 85. (Type, *Squalus canicula* Linnaeus, designated by Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 53.)

Scyllium Cuvier, Règne animal, vol. 2, p. 124, 1817. (Type, *Squalus canicula* Linnaeus, designated by Jordan and Evermann, Genera of fishes, pt. 1, p. 97, 1917.)

Scylliodus Agassiz, Poissons fossiles, vol. 3, p. 377, 1843. (Type, *Scylliodus antiquus* Agassiz, monotypic.)

Thyellina Agassiz, *idem*, p. 378. (Type, *Thyellina angusta* Agassiz, monotypic.) (Fossil.)

Palaeoscyllium Wagner, Anz. Bayer. Akad., vol. 44, p. 291, 1857.—Marek, Palaeontographica, Beitr. Naturg. Vorwelt, vol. 11, p. 67, 1863. (Type, *Palaeoscyllium decheni* Marek, monotypic.) (Fossil.)

Trigonodus Winkler, Arch. Mus. Teyler, vol. 4, p. 20, 1876. (Type, *Trigonodus primus* Winkler.) (Fossil.)

Body shorter than tail. Head short. Snout obtuse, short. Mouth large, labial folds on lower jaw. Teeth in numerous rows, each tooth with median larger cusp and one to several small lateral cusps. Nostrils distinct from mouth, when posterior nasal valve cirroid with rudimentary nasoral groove; nasal valves confluent, hind edge free and entire. Gill openings small, last above pectoral. Spiracle small, close after eye. Dorsals and anal small, latter largest fin. First dorsal above or behind ventral bases. Tail entire, caudal moderate or short. Ventrals of male more or less concrescent above claspers.

Small sharks of warm seas. Fossils known from the Cretaceous and Tertiary. In comparison with *Galeus*, Smith says: "The genus is indeed without serrations at the upper edge of the caudal fin, though these may sometimes be traced in the difference between the large spring scales in the upper rows on each side and the smaller and smoother ones in the median dorsal line at the said spot; but it has a compensation for them in the stronger development of the spiny scales on each side of the body above and behind the anal fin, which almost exactly resemble jaw teeth. These scales literally form a rasp, which the fish uses as a defensive weapon."

The egg cases are oblong and with long filamentous tendrils at each corner. As expelled, two at a time, the first pair of the filaments of the egg cases are wound around a branch of seaweed or other object by the female and there the egg capsule is left to its fate. The young sharks are said to hatch in six months' time.

ANALYSIS OF SPECIES

a^1. Front nasal valve reaches mouth; first dorsal origin postmedian in body; back with alternating light cross bands and darker ones with whitish spots. capensis

a^2. Front nasal valve not reaching mouth; first dorsal origin before middle in body; brown or gray, with irregular, small, whitish, round spots; dark brown blotches with similar spots, somewhat crossbandlike____ torazame

SCYLIORHINUS CAPENSIS (Müller and Henle)

Scyllium capense MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 11, 1841 (type locality: Cape of Good Hope).—ANDREW SMITH, Proc. Zool. Soc. London, 1837, p. 85 (Cape of Good Hope) (name only).—BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 21, p. (50, 57) 79, 1860 (Cape of Good Hope).—DUMÉRIL, Hist. Nat. Elasmobr., p. 320, 1865 (Cape of Good Hope).—PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p. 853 (Cape of Good Hope).—DAY, Fishes of India, pt. 4, p. 724, pl. 190, fig. 1, 1878 ("India"); Fauna British India, vol. 1, p. 31, 1889.

Scyliorhinus capensis REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 458, 1908 (South Africa).

Scylliorhinus capensis BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 40, 1925 (Table and False Bays to Natal, in 20 to 200 fathoms).

Scyliorhinus (*Scyliorhinus*) *capensis* NORMAN, *Discovery* Rep., vol. 12, p. 36, 1935 (lat. 34°2′ S., long. 17°4′ E., in 311 m.).

Catulus capensis GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 74, 1913 (South Africa).

Depth 7⅓ to subcaudal origin; head 6¼. Snout 2¾ in head, short, blunt; eye 6, 2 in snout; preoral length about ½ of snout; mouth gape 3⅔ in head, labial folds short, on lower jaw; teeth small, with 1 or 2 lateral denticles more or less distinct; front nasal valve reaches mouth, broad, with moderate attachment or median separation before symphyses; interorbital moderately high. Gill openings equidistant, last above pectoral base.

Scales small, tricuspid.

First dorsal postmedian in body, behind ventral, front edge 1⅗ in head; second dorsal inserted slightly before hind basal anal edge, front edge 1⅘ in head; anal length 1⅕; pectoral 1¼, width 2¼ its length which 2⅖ to ventral origin; ventral length 1⅗ in head; caudal 5⅞ in rest of body, subcaudal slightly deeper than anal, notch at last third.

Back with alternating light cross bands and darker ones with whitish spots. Lower surfaces uniform light. Length, 1,000 mm. (Day; Garman.)

South Africa, Natal. Day says: "The only reason for recording this as an Indian species is due to an example at the British Museum being thus marked, and from which the figure is taken. It is stuffed and about 40 inches in length." Regan mentions 6 specimens 600 to 1,000 mm. in the British Museum though without reference to Day's specimen.

SCYLIORHINUS TORAZAME (Tanaka)

Catulus torazame Tanaka, Journ. College Sci. Tokyo, vol. 23, p. 6, pl. 2, fig. 2, 1908 (type locality: Misaki, Sagami).—Garman, Mem. Mus. Comp. Zool., vol. 26, p. 77, 1913 (Misaki).—Tanaka, Jap. Fish. Life Colours, no 8, 1933.

Halaelurus torazame Tanaka, Fishes of Japan, vol. 5, p. 87, 1912.—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 190, 1920 (Awomori).—Schmidt, Compt. Rend. Acad. Sci. U. S. S. R., 1930, p. 18 (225), figs. 1–2 (clasper structure) (Tokyo, Fusan, Misaki; Nyström's example).

Halaelurus torazama Schmidt, Copeia, 1930, no. 2, p. 48, figs. 1-3; Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 4, 1931 (Misaki; Fusan).

Scyliorhinus torazame Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (reference).

Scyllium laticeps (not Duméril) Nyström, Svenska Vet.-Akad. Handl., vol. 13, pt. 4, p. 49, 1887 (Japan).

Scylliorhinus rudis Pietschmann, Anz. Akad. Wiss. Wien, vol. 45, p. 133, 1908 (type locality: Japan).

Ssyliorhinus rudis Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 457, 1908 (compiled).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 699, pl. 1, fig. 3, figs. 9-14 (head, teeth, etc), 1908 (Japan).

Halaelurus rudis Tanaka, Fishes of Japan, vol. 1, p. 13, fig. 12, 1911.—Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 400, 1912 (Hakodate).

Depth 6¾ to subcaudal origin; head 5⅘, width 1⅕. Snout 2⅗ in head; eye 5½, 2 in snout; mouth width 1⅔ in head, crescentic, upper labial groove ⅗ eye diameter or ⅓ length of lower groove; teeth numerous, rather small, tricuspid, equal in jaws; nostrils large, separate, nearer eye than snout tip, not confluent with mouth, least internarial width ½ eye; front nasal valve large, occupies inner ⅔ of nostril, overlapped another valve on posterior border of nostril about ¾ length of anterior; interorbital 2 in head. Gill openings small, last ones little more widely spaced, last 2 above pectoral base. Spiracle moderate, posterior to eye almost its own width.

Skin very rough; each scale with long central cusp and pair of short lateral cusps.

First dorsal inserted midway in total length or opposite hind basal ventral edge, front fin edge 1⅙ in head; second dorsal origin slightly before hind basal anal edge, front fin edge 1¾ in head; anal origin behind first dorsal base or little nearer subcaudal origin than ventral origin, front fin edge 2 in head; pectoral reaches slightly over half way to ventral, width 1½ its length which 1⅒ in head; ventral length equals head; caudal 4½ in rest of body, front subcaudal edge 1⅖ in head, notch at last fourth in caudal length.

Brownish or grayish, with irregularly scattered whitish round spots, each ⅙ to ⅕ of eye; dark brown blotches with similar spots, somewhat cross-bandlike and form large meshed reticulum by joining with one another. All fins, except anal, like body. Anal dusky or brownish (shown nearly uniform). Under surfaces pale. Length, 449 mm. (Tanaka.)

Japan, Korea.

Genus PORODERMA Andrew Smith

Poroderma ANDREW SMITH, Proc. Zool. Soc. London, 1837, p. 85. (Type, *Squalus africanus* Gmelin, designated by Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 53.)

Conoporoderma FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 234, 1934. (Type, *Scyllium pantherinum* Müller and Henle, orthotypic.)

Body rather stout, cavity more than half total length. Head less than one-fourth total. Snout short, longer than mouth, depressed, blunt. Eye small, lower lid with very slight fold. Mouth short, wide; labial folds at mouth angles only on lower jaws. Teeth small, tricuspid. Nostrils without grooves to mouth; front valves short, widely separated, not reaching mouth, with strong cirrus; hind valves wide, short. Gill openings moderate, narrow, last above pectoral. Spiracle moderate, behind eye. Scales small, tricuspid, median cusp elongate, acute. First dorsal behind ventrals, second dorsal smaller than first dorsal or anal.

South Africa.

ANALYSIS OF SPECIES

a^1. CONOPORODERMA. Nasal cirrus long, reaches mouth.
  b^1. Gray, with oval or circular more or less complete dark ocellate markings, arranged more or less as longitudinal bands______________ **pantherinum**
  b^2. Olive-brown above, with large close-set black spots, none larger than eye, also extend on fins including lower surfaces of paired ones____ **marleyi**
a^2. PORODERMA. Nasal cirrus shorter, not reaching mouth; pale gray to buff, with longitudinal blackish bands, one median on back, 2 or 3 lateral. **africanum**

Subgenus CONOPORODERMA Fowler

Nasal cirrus long, reaches mouth. Coloration largely with dark spots.

PORODERMA PANTHERINUM (Müller and Henle)

Scyllium pantherinum MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 13, pl. 7, fig., 1841 (type locality: Cape of Good Hope).—ANDREW SMITH, Illustr. Zool. South Africa, Fishes, pl. 29, fig. 3, 1849 (near Algoa Bay).—GRAY, List Fish British Museum, p. 31, 1851 (Cape Seas; Smith's specimen).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 322, 1865 (Cape of Good Hope).—BLEEKER, Verh. Akad. Wet. Amsterdam, vol. 18, p. 1, 1879 (Mauritius).

Scyllium africanum var. *pantherina* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 406, 1870 (type).

Poroderma pantherinum ANDREW SMITH, Proc. Zool. Soc. London, 1837, p. 85 (Cape of Good Hope) (name only).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 70, 1913 (South Africa).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 180 (Cape trawl, 140 fathoms; Tugela River, 60 fathoms; Natal coast, 34 fathoms); vol. 85, p. 234, 1934 (reference).

Scyliorhinus pantherinus REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 456, 1908 (South Africa; types of *Scyllium variegatum* Müller and Henle).

Scylliorhinus pantherinus GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 284, 1916 (references).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 40, pl. 2, fig. 5, 1925 (False Bay to Algoa Bay); pt. 2, p. 1013, 1927 (note).

Poroderma variegatum ANDREW SMITH, Proc. Zool. Soc. London, vol. 5, p. 85, 1837 (type locality: Cape of Good Hope) (name only).

Scyllium variegatum MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 14, 1841 (Cape of Good Hope).—ANDREW SMITH, Illustr. zoology of South Africa, Fishes, pl. 25, fig. 2, 1849 (Algoa Bay).—DUMÉRIL, Hist. Nat. Elasmobr. vol. 1, p. 322, 1865 (Cape of Good Hope).—BLEEKER, Verh. Akad. Wet. Amsterdam, vol. 18, p. 1, 1879 (Mauritius).

Scyllium africanum var. *variegata* GÜNTHER, Cat. fishes British Mus., vol. 8, p. 406, 1870 (type of *Scyllium variegatum* Müller and Henle).

Scyliorhinus variegatus REGAN, Ann. Natal Gov. Mus., vol. 1, p. 241, 1908 (Bird Island, Natal).

Poroderma submaculatum ANDREW SMITH, Proc. Zool. Soc. London, 1837, p. 85 (type locality: Cape of Good Hope) (name only).

Scyllium leopardinum (Van Horst) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 14, 1841 (name in synonymy).

Scyllium maeandrinum (Rapp) MÜLLER and HENLE, *idem* (name in synonymy).

Depth 8 to 11 to subcaudal origin; abdominal cavity 1⅔; head 5⅔ to 6½, width 1¼, broadly depressed. Snout 2¼ to 2⅓ in head, length 1½ its width; eye 4½ to 6¼ in head, 1¾ in snout, 2 in interorbital; preoral 3⅘ in head; mouth width 2, length 2 to 2⅛ its width; lower labial fold behind rictus and along lower jaw ⅖ mandibular ramus, absent in young; teeth 60 above, 56 below, tricuspid, median cusp slender and greatly longest; interorbital 2⅖ in head, slightly convex.

Scales moderate, rough on back and head above, flattened, foliate to weakly tricuspid, with strong median point.

First dorsal origin over last ⅖ of depressed ventral to hind ventral edge; second dorsal inserted little nearer anal origin than subcaudal origin, slightly smaller than first dorsal; anal begins behind depressed first dorsal base; pectoral width 1⅕ to 1⅓ its length; ventral length little greater than pectoral width; caudal 3⅓ in rest of body, front subcaudal edge 2¾ in entire fin.

Back and above drab, with many thick-set white spots, none larger than pupil and extend over unpaired fins and paired fins above. Under surface of body soiled buff. Smaller examples with spots and rings or enclosures. Smallest example fawn color on back, thickly spotted all over with rounded, close set, dusky spots, larger and more or less scattered on sides and on fins. Under surface whitish.

South Africa, Natal, Mauritius.

1 example. A.N.S.P. Cape trawl, in 140 fathoms. H. W. Bell Marley. Length, 970 mm.

A.N.S.P. No. 52996. Tegula River, Natal, in 60 fathoms. H. W. Bell Marley, 1923. Length, 402 mm.

A.N.S.P. No. 53139. Natal coast, in 34 fathoms. H. W. Bell Marley. Length, 250 mm.

PORODERMA MARLEYI Fowler

Poroderma marleyi FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 234, 1934 (type locality: Natal coast, in 20 fathoms).

Scyliorhinus regani (not Gilchrist) FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 188, fig. 1 (Natal coast in 20 fathoms); Ann. Natal Mus., vol. 5, p. 399, fig., 1926 (details of Natal specimen corrected).

Scylliorhinus regani BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 1013, 1927 (note on above).

Scyliorhinus leopardus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 361, 1935 (Durban) (lapsus specifically for *marleyi*).

Depth 5⅔ to subcaudal origin; head 4⅖, broadly depressed, width 1⅓ its length. Snout 2½ in head, length 1⅖ width, convexly rounded; eye 5½ in head, 2 in snout; mouth width 2 in head, length half its width, short labial fold at hind edge of each lip; teeth 22 above, 36 below, rather large, tricuspid, median cusp slenderly triangular and greatly longest; nostrils large, flap extends well over lip or ⅓ of interorbital; cirrus from front nasal valve reaches mouth, hind nasal valve without cirrus; nasoral groove rudimentary and front nasal valves not confluent across internarial space. Gill openings small, equidistant, last above pectoral base. Spiracle small, close behind eye.

Scales rather large, rough, tricuspid, median cusp greatly longest and usually with keel.

First dorsal inserted behind midlength, behind ventral base, front edge 1¾ in head; second dorsal inserted at middle in anal length, front edge 2⅓ in head, fin slightly smaller than first dorsal; anal larger than dorsals, length 1⅔ in head; caudal 3½ in rest of body, front subcaudal edge nearly half fin length, notch near last third; pectoral width 1¼ its length which 1½ in head; ventral 2½.

Olive-brown, with rather close large black spots above, none larger than eye. Spots also extend on fins including lower surfaces of paired ones.

Related to *Poroderma pantherinum* in its long anterior nasal cirrus, though the body short and robust and the coloration strikingly of large black rounded spots on the upper half of the body and over all the fins.

A.N.S.P. No. 53427. Natal coast in 20 fathoms. H. W. Bell Marley. Length, 225 mm. Type.

Subgenus PORODERMA Andrew Smith

Nasal cirrus short, not reaching mouth. Body with 3 to 5 blackish longitudinal bands.

PORODERMA AFRICANUM (Gmelin)

Squalus africanus GMELIN, Syst. Nat. Linn., vol. 1, p. 1494, 1789 (type locality: African Sea).—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 250, 1798 (Cape of Good Hope; on Gmelin).—SCHNEIDER, Syst. Ichth. Bloch, p. 129 (Africa), p. 549, 1801 (on Shaw).—CUVIER, Règne Animal, vol. 2, p. 124, 1817 (on Shaw); ed. 2, vol. 2, p. 386, 1829 (reference).

Scyliorhinus africanus Blainville, Bull. Soc. Philom. Paris, 1816, p. 121 (name only).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 456, 1908 (South Africa); Ann. Natal Gov. Mus., vol. 1, p. 241, 1908 (Bird Island).—Clark, Rep. Sci. Res. Scotia, Scot. Nat. Antarct. Exped., vol. 4, p. 394, 1915 (entrance to Saldanha Bay).

Scylliorhinus africanus Gilchrist and Thompson, Ann. Durban Mus., vol. 1, p. 283, 1916 (references).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 39, 1925 (False Bay to Algoa Bay; Madagascar); pt. 2, p. 1013, 1927 (note).

Scyllium africanum Andrew Smith, Proc. Zool. Soc. London, 1837, p. 85 (reference).—Müller and Henle, Syst. Beschr. Plagiostomen, p. 12, pl. 7, fig., 1841 (Cape of Good Hope).—Andrew Smith, Illustr. Zool. South Africa, Fishes, pl. 25, fig. 1, 1849 (South African Seas).—Gray, List. Fish. Brit. Mus., 1851, p. 31 (Cape Seas, Cape of Good Hope).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 321, 1865 (Cape of Good Hope).—Günther, Cat. Fishes British Mus., vol. 8, p. 405, 1870 (South Africa).—Bleeker, Verh. Akad. Wet. Amsterdam, vol. 18, p. 1, 1879 (Mauritius).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 6 (511), 1891.

Poroderma africanum Andrew Smith, Proc. Zool. Soc. London, 1837, p. 85 (reference).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 70, 1913 (Algoa Bay; Cape of Good Hope).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 189 (Bird Island, South Africa, in 40 fathoms).

Squalus vittatus Walbaum, Artedi Pisc., vol. 3, p. 516, 1792 (on Broussonet, Mém. Acad. Sci. Paris, 1780, p. 659, No. 9; Leipzig Mag., vol. 4, p. 335, 1786, type locality: Cape of Good Hope).—Shaw and Nodder, Nat. Misc., vol. 9, pl. 346, 1798 (African Seas).

Squalus striatus Lichtenstein, Descr. Anim. Forster, p. 407, 1844 (type locality: "In portu falso ad Prom. b. spei").

Scyllium africanum var. *africana s. striata* Günther, Cat. Fishes British Mus., vol. 8, p. 406, 1870 (Cape Seas; Cape of Good Hope).

Depth 7½ to subcaudal origin; abdominal cavity 2¾; head 4¾, depressed forward, broadly convex behind. Snout 2⅗ in head, length ⅔ width, triangular as viewed above and narrowing at tip; eye 5¼ in head, mouth length ½ width, labial fold behind rictus and on lower jaw, latter ⅓ mandibular ramus; upper teeth 48, lower 44, small, tricuspid, median cusp slender and greatly longest; nasal cirrus short, not reaching lip edge; interorbital ¼ wider than mouth.

Scales moderately rough on back and head above, tricuspid, median cusp long and large.

First dorsal inserted opposite hind depressed ventral edge, little smaller than ventral, front edge 1⅓ in head; second dorsal inserted little nearer subcaudal origin than anal origin, little smaller than first dorsal; anal nearly ⅓ again long as second dorsal; pectoral 1⅚ to ventral, width 1⅓ its length; caudal 3½ in rest of body, front subcaudal edge 2⅓ in fin.

When fresh, white with 5 stripes of black and faint one each side. Eye yellow, with white ring.

South Africa, Mauritius, Madagascar.

1 example. A.N.S.P. Bird Island, in 40 fathoms. H. W. Bell Marley. Length, 404 mm.

Genus HALAELURUS Gill

Halaelurus Gill, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 407, 1862. (Type, *Scyllium bürgeri* Müller and Henle, orthotypic.)

Holohalaelurus Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 235, 1934. (Type, *Scylliorhinus regani* Gilchrist, orthotypic.)

Aulohalaelurus Fowler, ibid., p. 237. (Type, *Catulus labiosus* Waite, orthotypic.)

Body short, caudal portion longer. Head short, depressed. Snout short. Mouth large, with labial fold around each mouth angle and on each jaw. Teeth small, numerous, with 3 to 5 cusps, rarely without lateral cusps. Nostrils with two valves; anterior widely separated across internarial space, not reaching mouth, cirrus absent or rudimentary and no groove to mouth. Gill openings narrow, last two above pectoral. Spiracle small, near corner of eye. Fins all small, first dorsal origin behind ventral origins. Second dorsal farther back than anal origin. Anal short. Subcaudal short.

South Africa, Arabian Sea, India, Australia, Japan, Southeast Pacific.

ANALYSIS OF SPECIES

a^1. Holohalaelurus. Mouth without labial folds; coloration variegated with dark or light spots.
  b^1. Anal base length greater than distance between anal and subcaudal origin. regani
  b^2. Anal base length less than distance between anal and subcaudal origin. punctatus
a^2. Halaelurus. Labial folds moderate or short, lower not extending halfway to symphysis.
  c^1. First dorsal smaller than second.
    d^1. First dorsal origin above midventral base; uniform blackish-- alcockii
    d^2. First dorsal origin above ⅔ of ventral base; brown, with pale cross bands and darker and lighter spots------------------------ bivius
  c^2. Dorsals subequal.
    e^1. First dorsal origin above midventral base; transverse dark bands, spotted with black--------------------------------------- bürgeri
    e^2. First dorsal origin above last third in ventral base.
      f^1. Dark, broad, transverse bands, with marblings and reticulations. natalensis
      f^2. Dark, narrow, transverse bands, about 20 or more------- quagga
  c^3. First dorsal larger than second.
    g^1. Uniform dull gray---------------------------------- hispidus
    g^2. Body variegated, not uniform.
      h^1. Body with darker brown spots, but no pale spots.
        i^1. With scattered small darker spots----------------- analis
        i^2. With numerous close-set, large, chestnut-brown spots, also 7 dark subequal saddles on back--------------- garmani
      h^2. Body brown, with ill-defined darker cross bars, also many cream white spots tending to form rings-------- vincenti
a^3. Aulohalaelurus. Labial folds greatly developed, extending along lower jaw nearly to symphysis-- labiosus

Subgenus HOLOHALAELURUS Fowler

Mouth without any labial folds or grooves. Coloration variegated with dark or light spots.

HALAELURUS REGANI (Gilchrist)

Scylliorhinus regani GILCHRIST, Marine Biol. Survey South Africa, Spec. Rep. No. 2, p. 45, 1922 (type locality: Cape seas, in 95 to 131 fathoms).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 42, 1925 (off Cape Point and East London, in 95 to 250 fathoms); pt. 2, p. 1013, 1927 (note).

Scyliorhinus (*Halaelurus*) *regani* NORMAN, *Discovery* Rep., vol. 12, p. 36, fig. 13, 1935 (lat. 34° S., long. 17° 58′ E., in 173 to 219 m.).

Halaelurus regani FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 235, 1934 (name).

Head broad, depressed. Snout obtusely pointed, length 1¼ in space between front edges of nasal flaps; mouth little more than twice wide as long; no labial folds, upper lip not overlapping lower; teeth with strong central and 1 or 2 lateral cusps; several prominent papillae behind mandibular teeth; front and hind nasal valves well developed, flaps without cirri and separated from each other by space 1½ in their hind edge.

First dorsal begins above hind end of "pectoral" [ventral] base, front angle rounded, hind angle not rectangular, base nearly 3 times space from second dorsal which 1½ times larger than first at its base; second dorsal origin before hind end of anal by about ¼ of latter; anal base 2½ in first dorsal base, 1⅔ in second dorsal base and nearly equals its distance to caudal; pectoral rounded, not reaching half way to ventral; in males 500 mm. long, posterior ventral edges united.

Upper surface covered with dark marks ¼ eye diameter, formed as spots, circles or horseshoe-shaped bands, all clearly contrasted with ground color. (Gilchrist.)

South Africa. According to Barnard the coloration is light, with darker spots on upper part of body and dorsal and pectoral fins, these spots being considerably larger than the intervening light ground color, except in the very young, and closely set so as to leave a reticulate pattern of ground color. Reaches 550 mm.

HALAELURUS PUNCTATUS (Gilchrist)

Scylliorhinus punctatus GILCHRIST, Marine Biol. Rep. South Africa, vol. 2, p. 129, fig., 1914 (type locality: Off Natal coast); Special Rep. No. 2, p. 46, 1922 (off Natal, in 148 to 226 fathoms).—BARNARD, Ann. South African Mus. vol. 21, pt. 1, p. 43, 1925 (type).

Halaelurus punctatus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 235, 1934 (name); vol. 87, p. 361, fig. 1, 1935 (Durban).

Scyliorhinus (*Halaelurus*) *polystigma* REGAN, Ann. Mag. Nat. Hist., ser. 9, vol. 7, p. 413, 1921 (type locality: Natal).

Snout rounded; mouth 1½ times wide as long, without labial folds, upper lip not overlapping lower at mouth angles; preoral length ½ space between outer edges of nasal flaps; nasal flaps without cirri, not confluent with upper lip, separated by interspace equal twice length hind edge of either flap. Hind gill openings smaller and closer together than anterior.

First dorsal begins above end of ventral base, front angle rounded, hind angle rectangular, base ⅖ interdorsal; second dorsal equals or larger than first, begins above basal end of anal; anal base 1¾ in first dorsal base, 1½ in second dorsal base, ⅔ space from subcaudal; pectoral rounded, reaches nearly ¾ to ventral origin; ventrals in male joined on basal third their hind edges.

Upper parts covered with numerous small round dark spots, also few white spots; 2 faint brown bands between gill slits, 1 below pectoral bases, 2 across body between pectorals and first dorsal, 1 before and 1 at first dorsal base, 2 between first and second dorsals. Length, 320 mm. (Regan; Barnard.)

South Africa, Natal.

Subgenus HALAELURUS Gill

Labial folds moderate or short, lower not extending halfway to symphysis of lower jaw.

HALAELURUS ALCOCKII Garman

Halaelurus alcockii GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 87, 1913 (on Alcock).

Scyllium canescens (not Günther) ALCOCK, Journ. Asiatic Soc. Bengal, vol. 65, p. 310, 1896 (type locality: Arabian Sea, in 620 to 690 fathoms); Cat. Deep Sea Fishes Indian Mus., p. 16, 1899 (brief comparative description).

Halaelurus canescens FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (part).

Snout rather long; eye rather small; labial folds at mouth angles rather large; teeth tricuspid, cusps subequal. Body covered with simple, stiff prickles. Second dorsal slightly larger than first; anal base moderate. Blackish with hoary gray surface. Some fins tipped white behind. Single small example. (Alcock.)

Arabian Sea. From the above imperfect account, originally compared with *Halaelurus hispidus*, Garman proposed the name *Halaelurus alcockii.*

HALAELURUS BIVIUS (Müller and Henle)

Scyllium bivium (Andrew Smith) MÜLLER and HENLE, Syst. Beschr. Plagistomen, p. 8, 1841 (type locality: Cape of Good Hope).—ANDREW SMITH, Proc. Zool. Soc. London, 1837, p. 85 (name only).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 321, 1865 (South Africa ?; Chile).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 405, 1870 (type).

Scyliorhinus bivius REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 461, 1908 (type: Chile, Patagonia).

Scylliorhinus bivius BARNARD, Ann. South African Mus., vol. 21, pl. 1, p. 44, 1925 (compiled).

Halaelurus bivius Garman, Mem. Mus. Comp. Zool., vol. 36, p. 86, 1913 (Chile).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (reference).

Scyllium brevicolle Philippi, Anal. Univ. Chile, vol. 71, p. 558, pl. 7, fig. 5, 1887 (type locality: Valparaiso, Chile).

Scyllium gayi Philippi, Anal. Univ. Chile, vol. 71, p. 558, 1877 (type locality: Chile).

Scyllium chilense (not Guichenot) Vaillant, Miss. Sci. Cap Horn, Poiss., p. 10, pl. 1, figs. 1, a–f, 1888 (Orange Bay).

Scylliorhinus chilensis Smitt, Svenska Vet.-Akad. Handl., vol. 24, p. 72, 1898.

Depth 8¼ to subcaudal origin, body shorter than tail; head 5, width 1½. Snout 2⅓ in head; eye 4¾, 2⅕ in snout, 2¼ in interorbital; mouth width 2¼ in head, length 1½ its width, upper labial fold slightly less than half upper jaw length, lower slightly shorter; teeth simple narrow cusps; nostrils with 2 valves, front valve not reaching mouth, without cirri, internarial 3½ in head; interorbital low, depressed, width 3. Gill openings equidistant, last 2 above pectoral base. Spiracle small, close behind eye.

Scales minute, tricuspid.

First dorsal little smaller than second, front edge 1½ in head, origin over last basal third of ventral; second dorsal inserted over middle of anal length, front edge 1¼ in head; anal small, base little longer than second dorsal base, front edge 2⅛ in head; caudal 4½ in rest of body, subcaudal high as anal, notch at last fifth its length; pectoral width 1¾ its length, which reaches ⅘ to ventral or 1⅒ in head; ventral length 1⅒.

Grayish brown. Back with ill-defined darker cross bands and scattered light spots. Dark and light spots also on fins. Length, 750 mm. (Vaillant; Garman.)

Originally credited to the Cape of Good Hope, the type in the British Museum. As the species has not since been reported there most writers have assumed its habitat to be off Chile and Patagonia.

HALAELURUS BÜRGERI (Müller and Henle)

Scyllium bürgeri Müller and Henle, Syst. Beschr. Plagiostomen, p. 8, pl. 2, 1841 (type locality: Japan).—Schlegel, in Siebold's Fauna Japonica, Pisces, pt. 15, p. 301, 1850 (bays of southwest Japan).—Gray, List Fishes British Mus., p. 30, 1851 (reference).—Bleeker, Verh. Batav. Genootsch., vol. 25, p. 21, 1853 (Japan); vol. 26, 1857, p. 42 (Japan); Act. Soc. Sci. Indo-Néerl., No. 5, vol. 1, p. (8) 69, 1856 (Amboina); vol. 2, No. 7, p. 9, 1857 (Amboina); vol. 3, No. 3, p. 3 (Kioesio), p. 7 (Japan), 1858; Nat. Tijdschr. Nederland. Indië, vol. 16, p. 209, 1858 (Batjan).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 320, 1865 (Japan).—Kner, Reise *Novara*, Fische, p. 412, 1865 (Madras).—Günther, Cat. Fishes British Mus., vol. 8, p. 404, 1870 (Japan, Formosa, Amboyna).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Nagasaki; Amboina).—Elera, Cat. Fauna Filip., vol. 1, p. 616, 1895 (Currimao, Luzon, Ilocos).

Scyllium bürgerii Weber, *in* Semon's Zool. Forsch. Reis. Australia, vol. 5, p. 276, 1895 (Ambon).

Catulus bürgeri Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 38 (128), 1901 (Nagasaki).

Halaelurus bürgeri Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 601, 1903 (Nagasaki; Misaki).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 83, 1913 (Japan; East Indies).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (China; Japan).—Schmidt, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 4, 1931 (Nagasaki).

Scyliorhinus buergeri Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 461, 1908 (Japan, Amboyna).

Depth 7⅞ to 8¾ to subcaudal origin; head 5⅘ to 5⅞, width 1⅒ to 1⅛. Snout 2⅓ to 2⅔ in head, broad, obtuse; eye 4 to 4½, long narrow slit, 1⅗ to 1⅔ in snout, 2 to 2⅕ in interorbital; dentary width 1⅘ in head, with short labial fold around each mouth angle and short space along lower jaw; teeth in 35 to 45 rows in jaws, with narrow triangular median cusp and 1 or 2 small cusps at each side basally, edges of all entire; nostrils much nearer mouth than snout tip, front valves short and wide, width of each 1½ in eye; internarial width 1⅖ in front valve width; hind nasal valves much narrower than front and neither reaching mouth; interorbital 2 to 2⅛ in head, depressed. Gill openings small, last smallest, third to fifth above pectoral. Spiracle small, close behind eye and opposite lower part of eye.

Scales rather rough, tricuspid, with median keel and 2 others each side, outermost of which on each smaller lateral cusp.

First dorsal origin behind ventral bases, length 1⅓ to 1½ in head; second dorsal origin begins behind anal base, length 2 to 2⅒ in head; anal nearer subcaudal origin than ventral origins, length 1½ to 1¾ in head; subcaudal length equals head to third gill opening, height 3½ to 4¼ in its length; least depth of caudal peduncle 4 to 4¼ in head; pectoral 1 to 1⅛, width 1¼ to 1⅖ its length; ventral 1¼ to 1⅓ in head.

Rufous-brown on back, whitish below. Nine deep rufous blotches or saddles on back, alternating irregularly along sides with some smaller similar-colored blotches. All these blotches marked with few irregular pale spots or blotches. Vertical fins clouded with little darker. Paired fins clouded little darker than lower surfaces.

India, East Indies, Philippines, China, Formosa, Japan.

U.S.N.M. No. 22558. Muiramisaki, Japan. Japanese Government. Length, 350 mm.

U.S.N.M. No. 48197. Otaru. S. Nozana. Length, 335 mm.

HALAELURUS NATALENSIS (Regan)

Scyllium natalense Regan, Ann. Mag. Nat. Hist., ser. 7, vol. 14, p. 128, 1904 (type locality: Natal).

Scyliorhinus natalensis Regan, Ann. Natal Gov. Mus., vol. 1, p. 241, 1908 (Bird Island).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, pt. 3, p. 283, 1916 (references).—Thompson, Marine Biol. Surv. South Africa, Spec. Rep. 3, p. 44, 1922 (off Natal, 24 to 194 fathoms).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 405, 1934 (Natal); vol. 87, p. 361, 1935 (Durban).

Scylliorhinus natalensis Gilchrist and Thompson, Ann. South African Mus., vol. 11, p. 55, 1911 (Durban).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 43, 1925 (Algoa Bay to Natal, in 50 fathoms).

Halaelurus natalensis Garman, Mem. Mus. Comp. Zool., vol. 36, p. 84, 1913 (Natal).

Head broad, depressed. Snout elliptical, with obtusely pointed tip; eye 1½ in snout; preoral length slightly more than half its greatest width or 2⅔ in internarial; labial fold at each mouth angle along lower jaw ⅖ space to symphysis, less than ½ along upper jaw; teeth tricuspid, median cusp longest.

First dorsal inserted over last third of ventral base; second dorsal inserted little before hind basal end of anal; dorsals subequal, base length of each ⅖ of interdorsal space; anal base 1½ times second dorsal base, 1⅔ times distance from caudal; pectoral reaches over halfway to ventral; ventral with outer edge evenly rounded anteriorly, becomes very oblique posteriorly.

Grayish. Back with broad transverse brown bands with darker edges and with less distinct intermediate bands of brown marbling or reticulations. Upper surface of head covered with reticulations, except for first cross band, which lies between hind halves of eyes and has convex posterior edge; second band as 2 oval patches at level of gill openings, nearly meet in median line; third at level of hind part of pectoral; fourth before dorsal, broken into median circular or oval and pair of lateral semioval patches; fifth and seventh through dorsal fin bases and 2 or 3 on tail. Each dorsal with dark blotch on its upper portion. Paired fins each with large dark blotch. Length, 425 mm. (Regan.)

Cape Colony, Natal. Originally described from two specimens in the British Museum.

HALAELURUS QUAGGA (Alcock)

Scyllium quagga Alcock, Cat. Deep Sea Fishes Indian Mus., vol. 1, p. 17, 1899 (type locality: off Malabar, in 102 fathoms); Illustr. Zool. *Investigator*, pt. 3, pl. 27, fig. 1-a, 1895 (dorsal view).

Scyliorhinus quagga Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 461, 1908 (compiled).

Halaelurus quagga Garman, Mem. Mus. Comp. Zool., vol. 36, p. 84, 1913 (Malabar).

Head 4½ to subcaudal origin, broad, depressed, width 1⅕ its length. Snout 2⅗ in head, flat, elliptical in outline with bluntly acuminate tip; eye 4, 1½ in snout, 1¾ in interorbital; preoral length half greatest breadth of snout; mouth large, crescentic, short labial fold only at angles; teeth tricuspid, median cusp longest and most acute; nasal valves separated by rather more than ⅖ snout length, each with very short, inconspicuous cirrus; interorbital 2⅖ in head. Gill openings graduated to last, above pectoral bases. Spiracle small, diameter equals pupil diameter, close behind and below eye.

Scales minute, tricuspid or anchor-shaped, except on throat and belly where granular.

Dorsals subequal, first inserted just before hind basal end of ventral, front edge 2 in head; second dorsal inserted before hind basal end of anal, front edge 2¼ in head; anal base little larger than either dorsal base, ½ to ⅔ in space to subcaudal; caudal 3⅓ in rest of body, subcaudal nearly half caudal length or its front edge 1⅔ in head and notch before last fourth in caudal length; pectoral about 1½ in head, width ⅞ length; ventral length 1½, hind edge very oblique.

Very numerous well-defined alternate cross bands of light and very dark brown on upper half of body, not passing to ventral surface; cross bands rather irregular in width, dark ones usually narrowest, not broken up into spots but as continuous stripes and intervening light cross bands unspotted. Length, 280 mm. (Alcock.)

Malabar coast.

HALAELURUS HISPIDUS (Alcock)

Scyllium hispidum ALCOCK, Ann. Mag. Nat. Hist., ser. 6, vol. 8, p. 21, 1891 (type locality: Andaman Islands, in 188 to 200 fathoms); Illustr. Zool. *Investigator*, pl. 8, figs. 3–3a, 1892; Journ. Asiatic Soc. Bengal, vol. 65, pt. 2, p. 310, 1896 (reference); Cat. Deep Sea Fishes Indian Mus., p. 15, 1899 (Andaman Sea, 188 to 419 fathoms).

Scylliorhinus hispidus BRAUER, Deutsch. Tiefsee Exped., *Valdivia*, vol. 5, Tiefseefische, p. 7 (366), 1906 (Andaman Sea, East African coast, 463 to 628 meters).

Scyliorhinus hispidus REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 460, 1908 (Indian Ocean).

Halaelurus hispidus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 85, 1913 (Andaman Sea).

Depth 7⅞ to subcaudal origin; head 4⅔, width 1¼. Snout 2⅕ in head; eye 4, 1⅞ in snout, 1¾ in interorbital; mouth large, crescentic, short labial fold only at angle; teeth in broad bands in jaws, small, mostly tricuspid, sometimes quincuspid; middle cusp much largest; nasal valves separated by interval nearly equal to nostril diameter, each with very short cirrus; preoral length half snout width and almost twice internarial. Gill openings equidistant, last 2 above pectoral base. Spiracle very small, diameter less than half pupil, close behind and below eye.

Scales minute, stony, tricuspid.

First dorsal inserted over last basal fourth of ventral, front edge 1⅔ in head; second dorsal inserted opposite middle in anal length, front edge 2 in head; anal length 1, front edge 2; caudal 2¼ in rest of body, subcaudal deep as anal, notch little behind last fourth; pectoral reaches 1¾ to ventral, 1¼ in head; ventral length 1½.

Dull stone gray, rather lighter ventrally. Length, 280 mm. (Alcock).

Off East Africa and Andaman Islands.

HALAELURUS ANALIS (Ogilby)

Scyllium anale Ogilby, Proc. Linn. Soc. New South Wales, vol. 10, p. 445 (type locality: Middle Harbor, Port Jackson), p. 464 (note), 1885; Cat. Fish. Australian Mus., pt. 1, p. 6, 1888 (type: Port Jackson).—Waite, Prelim. Rep. *Thetis* Exped., p. 38, 1898 (New South Wales).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 460, 1908 (New South Wales).

Scylliorhinus analis Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 4, p. 180, 1889 (Port Jackson).

Scyliorhinus analis McCulloch, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 3, 1911 (Bass Strait and New South Wales, 14 to 45 fathoms).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Scylliorhinus (*Halaelurus*) *analis* Waite and McCulloch, Trans. Roy. Soc. South Australia, vol. 39, p. 459, 1915 (Great Australian Bight, in 88 to 94 fathoms).

Catulus analis Waite, Mem. Australian Mus., vol. 4, p. 31, pl. 2, fig. 1, 1899 (New South Wales); Rec. Australian Mus., vol. 6, pt. 3, p. 228, pl. 40, fig. 38, 1906 (egg cases) (Port Jackson).

Halaelurus analis Garman, Mem. Mus. Comp. Zool., vol. 36, p. 85, 1913 (New South Wales).—Waite, Rec. South Australian Mus., vol. 2, p. 18, fig. 21, 1921.—McCulloch, Fishes New South Wales, ed. 2, p. 7, pl. 2, fig. 19a, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr. Java, p. 485, 1930 (reference).

Scyllium maculatum (not Günther) Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 97, 1880 (Port Jackson).—Johnston, Proc. Roy. Soc. Tasmania, 1882, p. 138, 1883.

Depth 9 to 10½ to subcaudal origin; head 5⅘ to 6, width 1⅓ to 1½. Snout 2½ to 2¾ in head, depressed, rounded as seen from above; eye 4 to 4⅛, 1⅗ to 1⅔ in snout, 1⅓ in interorbital; dentary width 2⅕ to 2½ in head, short groove at each angle though lower groove trifle longer; teeth in 50 to 53 rows above, 40 below, each tooth with 3 to 5 cusps of which median longest, all narrowly triangular and with entire edges; nostrils in last half of preoral length; front nasal valves short, wide, each equals internarial space, not nearly reaching mouth and anterior not entirely concealing posterior valve which not at all confluent with anterior valve on inner edges; interorbital 2⅛ to 2⅕ in head, broadly and slightly convex. Gill openings with first largest, gradually smaller to fifth and fourth and fifth above pectoral. Spiracle small, close behind and level with eye.

Scales small, tricuspid and median cusp longest and best developed.

First dorsal origin close behind ventral base, length 1⅗ to 1⅔ in head, hind lobe right angle; second dorsal inserted opposite last ⅖ of anal base, length 1⅖ to 1½ in head; anal origin midway between first and second dorsal origins, length of fin equals head; subcaudal longer than head to last gill opening, height 4⅓ to 4⅔ in its length; least depth of caudal peduncle 3¼ to 3⅔ in head; pectoral 1⅛ to

1¼, width 1¼ of its length; ventral 1⅛ in head; claspers of young male not extended beyond ventral fins.

Brown above to whitish below. About 8 obscure or diffuse slightly darker blotches on back. Back, also head above, with scattered small and still darker spots. Dorsals and caudal all brownish like back, also upper surfaces of paired fins.

New South Wales, Victoria, Tasmania, South Australia.

U.S.N.M. No. 40016. Port Jackson. Australian Museum. Length, 612 mm.
U.S.N.M. No. 40027. Port Jackson. Australian Museum. Length, 515 mm.

HALAELURUS GARMANI Fowler

FIGURE 1

Halaelurus garmani FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 235, fig. 1, 1934 (type locality: East Indies).

Depth 6½ to subcaudal origin; head 5, width 1⅓. Snout 2¾ in head, broad and obtuse as seen from above; eye 4, 1½ in snout, 2 in interorbital, without nictitating fold; dentary width 2⅔ in head, with short labial groove only at angle of lower jaw; teeth in 36 rows above, 30 rows below, each of narrowly triangular median with large cusp and small similar cusp each side of base, edges of all entire; as seen in profile nostrils nearer eye than snout tip, both valves entire, front ones separated by interspace half their width, both without cirri and anterior reach mouth and concealing posterior; interorbital 2 in head, depressed. Gill openings small, first deepest with others gradually smaller to fifth, both fifth and sixth above pectoral base. Spiracle small, little behind and level with lower part of eye.

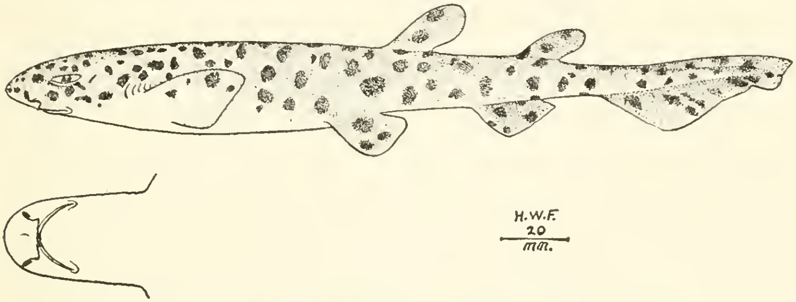

FIGURE 1.—*Halaelurus garmani* Fowler: Type (U.S.N.M. No. 43749).

Scales finely velvety to touch, rather small, each with median point and small point each side basally.

First dorsal origin close behind end of ventral base, length 1⅓ in head; second dorsal origin at first ⅖ of anal base, length 1½ in head; anal origin midway between ventral origins and subcaudal origin, length 1½ in head; subcaudal large, height ⅓ its length, which slightly greater than head to last gill opening; pectoral 1⅕ in head, width 1¾ its length; ventral length 1¾ in head; least depth of caudal peduncle 3¾.

Light brown generally. Back and upper surface profusely marked with rather large chestnut brown spots and over top of back where bounding about 7 dark saddles or blotches, arranged so as nearly subequal in size with pale interspaces. All fins with some dark or chestnut brown spots.

Apparently allied with *Halaelurus analis* (Ogilby) but differing in coloration, the dark spots large and prominent or in contrast and these defining about 7 rather dark bands transversely or saddles on the back.

East Indies.

U.S.N.M. No. 43749. East Indies. Length, 240 mm. Type.

HALAELURUS VINCENTI (Zietz)

Scyllius vincenti Zietz, Trans. Roy. Soc. South Australia, vol. 32, p. 287, 1908 (type locality: Investigator Strait and Kangaroo Island, South Australia).

Scyliorhinus vincenti McCulloch, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 4, pl. 2, fig. 3, fig. 1, 1911 (mouth) (Zietz example; off Murray River mouth in 20 fathoms).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 484, 1930 (reference).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Scylliorhinus vincenti Waite, Rec. South Australian Mus., vol. 2, no. 1, p. 17, 1921.

Depth 8 to subcaudal origin; head 5½. Snout 2⅖ in head, rounded, blunt in profile; eye 4⅘, 1⅞ in snout, inferior fold well marked; preoral 2⅕ in head; mouth width about 1½, with distinct fold around mouth angle, lower fold longer than upper but less than halfway to symphysis; teeth tricuspid, median cusp longer than laterals; nasal valves produced as lobes outward and backward, hind borders emarginate, without cirrus, interspace slightly more than 1 lobe; interorbital greater than snout length, but little elevated. Gill openings graduated smaller to last, which half wide as first and above pectoral base. Spiracle large, oval, close behind eye.

Scales quadrilateral and keeled on head, triangular and acutely pointed dorsally, tricuspid on sides.

First dorsal inserted slightly before middle in total length or behind hind basal ventral end, front edge 1⅖ in head; second dorsal origin over last fourth of anal base, front edge 1⅔ in head; anal length 1$\frac{1}{10}$; pectoral reaches 1⅘ to ventral, width 1¼ its length, which 1⅓ in head; ventral length equals head measured to second gill opening; caudal 4⅓ in rest of body, front subcaudal edge 1⅔ in head, notch at last fourth.

Chocolate-brown above, with ill-defined darker cross bars. Indications of dark blotches on sides, hinder half of head, body, tail, and fins with many creamy white spots, which tend to form rings. Length, 414 mm. (McCulloch.)

South Australia.

Subgenus AULOHALAELURUS Fowler

Labial folds greatly developed, extend along lower jaw nearly to symphysis.

HALAELURUS LABIOSUS (Waite)

Catulus labiosus WAITE, Rec. Australian Mus., vol. 6, pt. 2, p. 57, fig. 23, 1905 (mouth) (type locality: Freemantle, West Australia).

Halaelurus labiosus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 88, 1913 (Australia).—OGILBY, Mem. Queensland Mus., vol. 5, p. 77, 1916 (Cape York).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (reference); Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 237, 1934 (name).

Aulohalaelurus labiosus WHITLEY, Rec. Australian Mus., vol. 19, no. 2, p. 153, fig. 1, 1934 (type); Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Squalus maculatus (not Bonnaterre) SCHNEIDER, Syst. Ichth. Bloch, p. 130, 1801 (type locality: Oriental Ocean).

Scyliorhinus maculatus BLAINVILLE, Bull. Soc. Philom., Paris, p. 121, 1816 (name).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 462, 1908 (Australia; note on Günther's specimen).

Scylliorhinus maculatus OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 4, p. 179, 1889 (northwest coast of Australia; Bramble Bay; Port Darwin).

Scyllium maculatum GÜNTHER, Cat. Fishes British Mus. vol. 8, p. 401, 1870 [Bramble Bay (=Bramble Bay, Queensland)].—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 2, p. 366, 1878 (Port Darwin); vol. 5, p. 297, 1880 (Port Darwin, Port Jackson); vol. 6, p. 361, 1881 (Port Darwin; Port Jackson).

?*Squalus cuvier* (Peron and LeSueur) LESUEUR, Journ. Acad. Nat. Sci. Philadelphia, vol. 2, p. 351, 1822 (type locality: Northwest coast New Holland).

Body elongate, vent before midlength; head 7¾ in total length, much depressed, width considerably more than length in advance of spiracles. Snout 3⅕ in head; eye 4⅖; mouth width 1½, long labial fold around angles, fold of upper jaw extended anteriorly beyond lobe of nasal valve to short distance of nostril; lower labial folds approach each other to within length of base of one of nasal lobes; teeth in several rows in both jaws, lower larger, all with small cusp each side; nasal valves separate, each produced into lobe directed outward and backward, space between two slightly more than basal width of one lobe, without cirrus; interorbital 2⅔ in head. Gill openings narrow.

Skin rough.

First dorsal origin above hind edge of vent or over hind portion of ventral bases; hind end of anal base below middle of second dorsal; anal base little if any longer than dorsal base, shorter than space to subcaudal; pectoral equals head; ventral obliquely truncate.

Brown above, lighter beneath. Hind part of head, body and under surface, from between pectorals backward, ornamented with fairly uniform black spots. Dorsals, anal, and caudal similarly marked. Three rows of spots on ventrals tend to form transverse bars. Length, 620 mm. (Waite; Garman.)

Western Australia, North Australia, Queensland. Though Waite's name has been accepted for this species, *Squalus cuvier* Lesueur, very incompletely noticed as follows, may be intended for it:

Head and body very thick. Dorsal moderately emarginate. Caudal superior in position. Lunulated emargination above tail, another beneath at base of fin. Irregular blackish spots on body from summit of head to caudal fin, which also spotted; spots disposed in 3 rows, which rather irregular on anterior part.

Genus PENTANCHUS Smith and Radcliffe

Pentanchus SMITH and RADCLIFFE, Proc. U. S. Nat. Mus., vol. 41, p. 490, 1912. (Type, *Pentanchus profundicolus* Smith and Radcliffe, monotypic.)

Apristurus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 96, 1913. (Type, *Scylliorhinus indicus* Brauer, orthotypic.)

Apristurius SCHULZE, KÜKENTHAL, et al., Nomencl. Animal., Band 1, Lief 2, p. 244, 192. (Type, *Scylliorhinus indicus* Brauer.)

Parapristurus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 237, 1934. (Type, *Catulus spongiceps* Gilbert, orthotypic.)

Body about half total length. Snout elongate. Eye large. Mouth large, with labial folds on both jaws. Teeth small, with 3 to 5 cusps. Front nasal valves separate from one another and from mouth; usually cirrus on one or both nasal flaps. Gill openings small, last above pectoral. Spiracle small, near eye. Upper caudal edge not armed with enlarged scales. Dorsals small, inserted behind body cavity, first dorsal sometimes absent. Anal, subcaudal, and ventrals large, close together. Caudal axis not elevated. Pectorals moderate. Ventrals inserted before middle in total length.

Small sharks in deep water or bathypelagic and of uniform coloration. The true relations of the genus were at first misunderstood as Regan pointed out:[2] "*Pentanchus profundicolus* is described as a new genus and species, and the representative of a new family of notidanoids; in my opinion this fish belongs to the family Scyliorhinidae, and if, as I suspect may be the case, the absence of the first dorsal fin is abnormal or accidental, it is a *Scyliorhinus* closely related to the species numbered 11 to 14 in my synopsis [*indicus*, *brunneus*, *spongiceps*, and *profundorum*]."

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[2] Science, new ser., vol. 36, no. 916, p. 81, 1912.

ANALYSIS OF SPECIES OF PENTANCHUS

a^1. Parapristurus. Nasal valves entire, without cirri.

b^1. First dorsal origin behind middle in total length; pectoral reaches 3/5 to ventral; caudal more than 2 in rest length of body.

c^1. Anal and subcaudal equally long ---------- spongiceps

c^2. Anal about 2/3 long as subcaudal ---------- verweyi

b^2. First dorsal origin well before middle in total length; pectoral nearly reaches ventral; caudal less than half rest length of body ---------- herklotsi

a^2. Pentanchus. Nasal valves with at least small cirrus anteriorly.

d^1. Dorsals equal, or nearly so.

e^1. Pectoral not reaching ventral

f^1. First dorsal inserted before midlength ---------- macrorhynchus

f^2. First dorsal inserted midway in length ---------- platyrhynchus

e^2. Pectoral quite reaches ventral ---------- profundicolus

d^2. Second dorsal larger than first ---------- saldanha

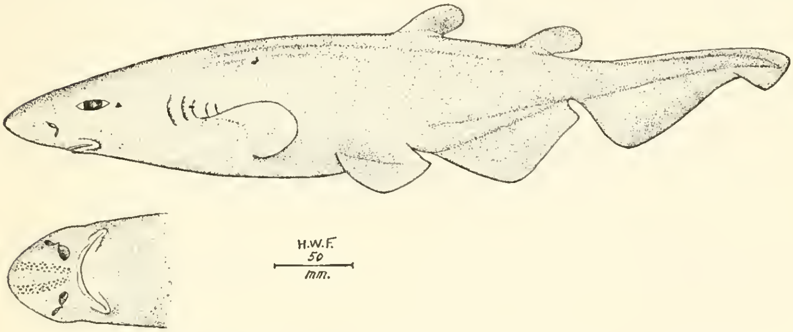

Figure 2.—*Pentanchus spongiceps* (Gilbert) : Type (U.S.N.M. No. 51590).

a^3. Apristurus. Nasal valves each with anterior and posterior nasal cirrus; first dorsal inserted before mid length, smaller than second dorsal.

g^1. Paired fins larger, pectorals nearly or quite reach ventrals.

h^1. Subcaudal lower than anal ---------- indicus

h^2. Subcaudal deep as anal ---------- sibogae

g^2. Paired fins smaller, pectorals not reaching ventrals; subcaudal deep as anal ---------- microps

Subgenus Parapristurus Fowler

Nasal valves entire, without cirri. First dorsal inserted behind midlength, smaller than second dorsal.

PENTANCHUS SPONGICEPS (Gilbert)

Figure 2

Catulus spongiceps Gilbert, Bull. U. S. Fish Comm., vol. 22 (1903), pt. 2, p. 579, 1905 (type locality: Bird Island, Hawaii, in 572 to 1,463 meters).

Scyliorhinus spongiceps Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 459, 1908 (reference).—Weber, *Siboga* Exped., Fische, vol. 57, p. 595, 1913 (Banda Sea in 1,158 m.).

Pristiurus spongiceps Garman, Mem. Mus. Comp. Zool., vol. 36, p. 94, 1913 (on Gilbert).

Apristurus spongiceps Fowler, Mem. Bishop Mus., vol. 10, p. 17, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (type).

Pentanchus spongiceps Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 237, 1934 (name).

Depth 3¾ to subcaudal origin; head 3¼, width 1¾. Snout 2⅕ in head, very pliable, flabby, depressed; eye 6⅗, 3 in snout, median laterally in head; dentary width 2 in head, both labial folds long as eye; teeth in 36 rows in jaws, each with 3 to 5 cusps; nostrils large, little longer than eye, internarial space half mouth width; interorbital broadly convex. Gill openings little less than eye. Spiracle small, distinct, close behind eye.

Skin densely covered with simple small cusps, mostly finely roughened to touch, fin edges and areas of depression behind naked.

First dorsal length 2¾ in head, fin inserted largely over ventral bases; second dorsal length 2⅓, inserted over middle of anal, ends slightly behind end of anal, not "terminating slightly in advance of its end" as Gilbert states; caudal 2⅘ in rest of body, with notch near end and subcaudal subequal with anal; anal length 1⅖ in head; pectoral base 2 in fin length, which 2 in head; ventral length 2, fin broad.

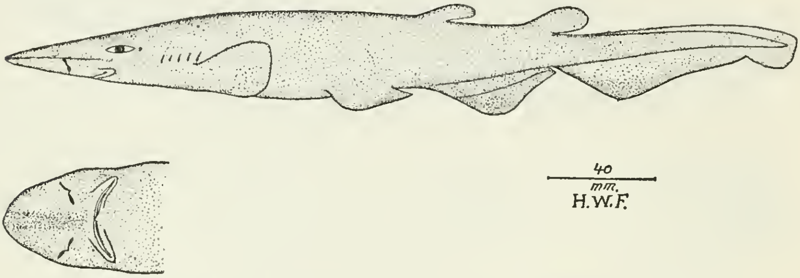

Figure 3.—*Pentanchus verweyi* Fowler: Type (U.S.N.M. No. 93135).

Dull gray-brown, with traces of sepia brown shades around thorax, gills, fin edges, and depressions.

Known only from the type, described above, and the example reported from the Banda Sea by Weber.

U.S.N.M. No. 51590. Bird Island, Hawaiian Group. *Albatross* collection. Length, 482 mm. Type of *Catulus spongiceps* Gilbert.

PENTANCHUS VERWEYI Fowler

Figure 3

Pentanchus verweyi Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 237, fig. 2, 1934 (type locality: Station D. 5587, vicinity Sibuko Bay, Borneo).

Depth 6⅕ to subcaudal origin; head 3⅖, width 1⅖. Snout 1⅗ in head; eye 5, 3⅕ in snout, 1½ in interorbital; mouth width 2 in head, little arched, long labial folds around each angle; teeth in about 40 rows above, 38 rows below, tricuspid, upper slightly larger, all with median cusp largest; nostrils long as eye, slightly less than internarial, which 2¼ in mouth width or 2⅔ in preoral length which 1⅔ in head; interorbital 3, broad, little convex. Gill openings small, subequal, last little shorter than fourth, last 2 above pectoral base. Spiracle close behind eye.

Scales minute, tridentate, and tricarinate, median point longest.

First dorsal base over front of anal, origin little nearer caudal tip than snout tip, fin length 2⅞ in head; second dorsal origin over last ⅖ in ventral base, fin length 2⅓ in head; anal 1⅙, height about ⅓ its length; caudal 2¼ in rest of body, subcaudal height 4⅕ in its length; pectoral 1¼ in head, width 1½ its length, which reaches 1¾ to ventrals; ventral 1⅞ in head.

Uniform brown. Inside mouth and gill openings blackish.

U.S.N.M. No. 93135. D. 5587. Sipadan Island (W.), S. 12° E., 3.8 miles (lat. 4° 10′ 35″ N., long. 118° 37′ 12″ E.), vicinity Sibuko Bay, Borneo. *Albatross* collection No. 10287. Length, 267 mm. Type.

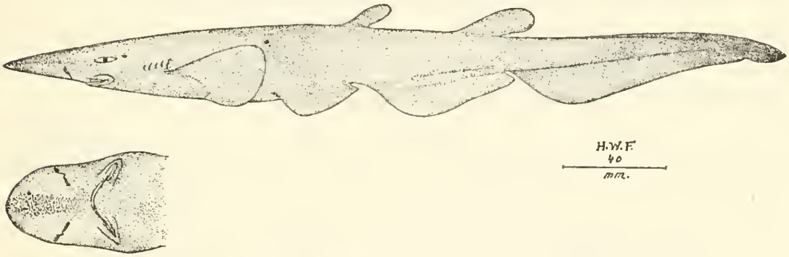

FIGURE 4.—*Pentanchus herklotsi* Fowler: Type (U.S.N.M. No. 93134).

Differs from *Scyliorhinus macrorhynchus* Tanaka in the eye with its front edge nearer the pectoral origin than the snout tip, base of first dorsal entirely behind ventral, second dorsal greatly larger than first and caudal little over ⅔ total length. It differs from *Scyliorhinus platyrhynchus* Tanaka in that the front edge of the eye is little nearer pectoral origin than snout tip and second dorsal base much larger than first dorsal base.

PENTANCHUS HERKLOTSI Fowler

FIGURE 4

Pentanchus herklotsi FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 238, fig. 3, 1934 (type locality: Station D. 5424. Jolo Sea).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 12, 1937 (reference).

Depth 6⅔ to subcaudal origin; head 3⅗, width 1⅖. Snout 1⅗ in head; eye 5⅗, 3⅔ in snout, 2¼ in interorbital; dentary width 1⅞ in head, with long labial folds along each mouth angle; teeth in 38 rows above, 36 below, each tooth large erect slender pointed median cusp, above medially with smaller basal cusp each side and toward corners of mouth 2 smaller basal cusps each side, most all lower teeth with 2 basal small cusps each side; nostrils oblique, longer than eye, internarial greater than either nostril or 2 in mouth width or 2⅔ in preoral length, which 1⅗ in head; interorbital 2¾, broadly (damaged) and slightly convex. Last gill opening largest, last 2 over pectoral base. Spiracle small, close behind eye.

Scales very minute, tridentate, points all slender, median longest, each smaller lateral well free.

First dorsal origin little before ventral base, fin length 2⅘ in head; second dorsal origin slightly behind middle in anal base, fin length 2⅛ in head; anal length about equals head, height about 3¾ in base length; subcaudal length equals 1¾ head lengths, depth about ⅙ its length; pectoral width 1⅓ its length, which 1⅖ in head; ventral 1⅔.

Uniform brown. Inside mouth and gill openings black.

Approaches *Scyliorhinus indicus* Brauer, differing in that the internarial is greater than the eye, pectorals much greater than postocular region to last gill opening, middle of ventrals falls at first ⅖ of total length, origin of first dorsal well before middle in total length and long caudal more than ⅓ total length.

U.S.N.M., No. 93134, D. 5424, Cagayan Island (S.), S. 11° W., 3.4 miles (lat. 9° 37′ 05″ N., long. 121° 12′ 37″ E.), Jolo Sea. March 31, 1909. *Albatross* collection No. 10261. Length, 312 mm. Type.

Subgenus PENTANCHUS Smith and Radcliffe

Nasal valves with at least small cirrus anteriorly.

PENTANCHUS MACRORHYNCHUS (Tanaka)

Scyliorhinus macrorhynchus TANAKA, Journ. College Sci. Tokyo, vol. 27, p. 1, 1909 (type locality: Misaki, Sagami).

Scylliorhinus macrorhynchus IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus., (Vertebrata), p. 190, 1920 (Misaki).

Apristurus macrorhynchus GARMAN, Mem. Mus. Comp. Zool. vol. 36, p. 97, 1913 (Misaki).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (reference).—J. SCHMIDT, Compt. Rend. Acad. Sci. U. S. S. R., vol. 11, p. 630, 1930 (Misaki).—J. SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 5, 1931 (Misaki).—TANAKA, Jap. Fish. Life Colours, no. 10, 1933.

Depth 9⅔ to subcaudal origin, body elevated, rather slender; head 4, depressed. Snout 1⅗ in head, long, acutely pointed, rather rounded as seen above; eye 5⅖, lateral, elevated; mouth width 2¼, large, moderately curved, lower labial fold little less than half space to symphysis and upper labial fold 1½ times long as lower; preoral length slightly less than 2 in head; teeth tricuspid, median cusp largest, subequal; internarial 6, each valve with anterior cirrus; interorbital 2⅔, gently convex. Gill openings small, median longest, last 2 closer and last above pectoral base. Spiracle very small, subcircular, directly behind eye.

Scales tricuspid, small, finely velvety to touch and slightly enlarged on caudal peduncle.

Dorsals subequal, small, slender, oblong, base length of first $3\frac{5}{7}$ in head; hind basal end of second dorsal before hind anal base by space $\frac{2}{3}$ eye diameter; interdorsal space slightly less than snout length; anal base $1\frac{1}{8}$ in head, continuous with caudal but with deep notch extending almost to fin base; caudal rather long, subcaudal little elevated anteriorly, without terminal notch; pectoral moderate, not reaching ventral by space equal to postocular; ventrals separate, origin slightly nearer anal origin than last gill opening.

Dark gray, paler beneath. Inside mouth, gill openings, and nasal valves blackish. Each fin with blackish anterior and whitish posterior edge. Length, 470 mm. (Tanaka.)

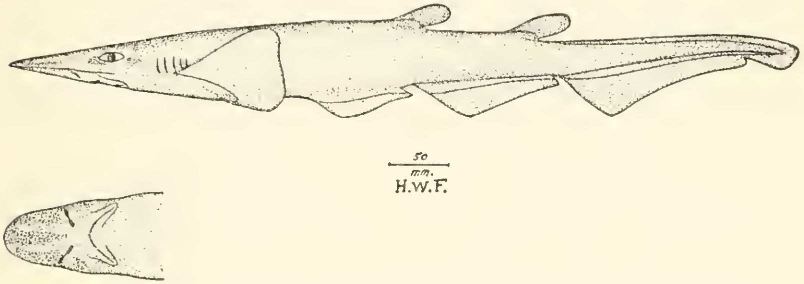

FIGURE 5.—*Pentanchus platyrhynchus* (Tanaka): U.S.N.M. No. 22623, from Japan.

Sagami Sea, Japan. Schmidt's description differs from the above, as he says "length of head 3, 7 in the width, 7.1 length of body to root of lower lobe of the caudal fin." His specimen 492 mm.

PENTANCHUS PLATYRHYNCHUS (Tanaka)

FIGURE 5

Scyliorhinus platyrhynchus TANAKA, Journ. College Sci. Tokyo, vol. 27, p. 4, 1909 (type locality: Misaki, Sagami).

Apristurus platyrhynchus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 98, 1913 (Japan).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, No. 2, p. 99, 1925 (Sagami).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference).

?*Pentanchus* sp. JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 100, 1925 (mounted specimen in Yamado Museum).

Depth $7\frac{1}{3}$ to subcaudal origin; head $3\frac{4}{5}$, width $1\frac{4}{5}$. Snout $1\frac{3}{5}$ in head, long, depressed, spatulate; eye $6\frac{1}{3}$, $3\frac{3}{4}$ in snout, $2\frac{3}{4}$ in interorbital; dentary width $2\frac{3}{4}$ in head, with long labial folds around each mouth angle; teeth in 48 rows above, 36 rows below, upper tricuspid, lower quincuspid; nostrils not quite long as eye, internarial behind middle in preoral length, $4\frac{1}{8}$ in preoral length, which $1\frac{4}{5}$ in head; interorbital 3, broadly convex. Third gill opening largest, fourth and fifth above pectoral base. Spiracle small, porelike, close behind eye.

Scales very minute, tridentate, with median keel.

First dorsal origin close behind ventral base, length 2⅗ in head; second dorsal origin opposite middle in anal base, length 2¼ in head; anal equals head, height 4 in its base; subcaudal long as head to last gill opening, height of fin 4¾ in its length; pectoral width 1⅕ in its length, which 1⅖ in head; ventral 1½.

Uniform dark brown, slightly paler on belly and under surface of head. Inside mouth and gill openings blackish brown.

Japan. The specimen described above was presented to the National Museum in 1878, many years before the species was described by Tanaka. Tanaka's account is as follows:

Depth 8⅔ to subcaudal origin; head 4⅗. Snout trifle less than 2 in head, pointed, broadly curved; eye 5⅕, lateral, elevated, midway between snout tip and fourth gill opening; mouth moderately curved, upper labial folds slightly less than halfway to hind end of front nasal valve, lower labial fold ⅖ to symphysis; teeth tricuspid, median cusp largest, rather wide set; front nasal valves well separated from each other and from mouth, with cirrus anteriorly; interorbital very broad, gently convex. Gill openings small, subequal, equidistant, last above pectoral base. Spiracle small, circular, just behind eye.

Scales very small, very finely velvety to touch, scarcely enlarged on caudal peduncle and not forming distinct ridge.

First dorsal small, inserted slightly before anal origin; second dorsal inserted above end of first ⅗ of anal base, its base ⅔ that of first dorsal; anal long, highest forward, continuous with lower caudal lobe but with deep notch to fin base; caudal not turned upward, lower lobe continuous with lower part of upper lobe with slight notch, base length of former 4 times long as that of latter; pectoral rather large, not reaching ventral, hind edge nearly straight; ventrals separate, extend little over halfway to anal.

Blackish brown, paler beneath. Hind edges of all fins, edges of gill openings, and inside mouth black. Length, 800 mm.

U.S.N.M. no. 22632. Japan. Japanese Government. Length, 657 mm.

PENTANCHUS PROFUNDICOLUS Smith and Radcliffe

Pentanchus profundicolus SMITH and RADCLIFFE, Proc. U. S. Nat. Mus., vol. 41, p. 490, fig., pl. 42, 1912 (type locality: Mindanao Sea).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 95, 1913 (note).—HERRE, Philippine Journ. Sci., vol. 26, no. 1, p. 127, 1925 (compiled).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 12, 1937 (reference).

Pentachus profundicolus FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (type). (Error.)

Depth 5 to subcaudal origin; head 3⅖, width 1⅞. Snout 2 in head, long, depressed, pointed or rather narrowly triangular as seen from above; eye 6¾, 3¾ in snout, 1½ in interorbital; dentary width 2⅔ in head, with long labial folds around each mouth angle; teeth in about 44 rows above, 40 rows below, all more or less quincuspid, some median upper tricuspid; nostrils little shorter than eye, internarial within last third of preoral length, 3 in preoral length, which 2 in head; interorbital 4, broadly convex. Fourth gill opening largest, fourth and fifth over pectoral base.

Scales very minute, tridentate, with median keel and median denticle longest.

Single dorsal begins little behind middle of anal base, fin length 1⁹⁄₁₀ in head; anal about 1⅛, height 4½ in its base; caudal 2¼ in rest of body; subcaudal 1¼ in caudal length, height 5⅕; pectoral 1⅗ in head, width 1¼ in its length, nearly reaches ventral; ventral 2¼ in head, claspers with modified bony spur projecting forward from inner edge, both claspers extending beyond depressed ventrals.

Uniform dark brown, fins slightly deeper colored. Inside mouth dark like general body color.

Known only from the type.

U.S.N.M. no. 70260. Mindanao Sea, station 5486. *Albatross* collection. Length, 500 mm. Male. Type.

PENTANCHUS SALDANHA (Barnard)

Scylliorhinus saldanha Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 44, 1925 (type locality: off Saldanha Bay, in 500 fathoms).

Scyliorhinus (*Apristurus*) *saldanha* Norman, *Discovery* Rep., vol. 12, p. 36, 1935 (lat. 34°8′ S., long. 17°17′33″, in 402?–548 m.).

Head (measured to last gill opening) 5 in total length, 2½ to vent. Eye (not orbit as indicated by scaleless skin) 7½ in head (measured to last gill opening), 3 in snout, 2 in interorbital; lower labial fold extends halfway to mandibular symphysis, upper labial fold halfway to nasal cavity; teeth tridentate, only 1 lateral cusp each side of median; nostril equals eye, with only indication of cirrus opposite cirrus on front flap, which not confluent with its fellow.

Scales ovoid, tricarinate, median keel ending in point, later ones ending in obscure points. Conspicuous patches of mucous pores on upper and lower surfaces of snout, especially in middle line and below eyes.

First dorsal inserted above vent, slightly smaller than second; basal end of second dorsal opposite basal anal end; fin base equals space between hind basal pectoral end and ventral origin; interdorsal space equals space between snout tip and spiracle; anal origin slightly behind basal end of first dorsal, distant from vent space equal to snout length; ends of pectorals separated from ventral origins by space equal to snout length or ventral base length. Claspers reach anal origin.

Slate gray, smooth skin at pectoral bases, etc., blackish brown. Pupil pale translucent green. Length, 810 mm. (Barnard.)

Off South Africa.

Subgenus APRISTURUS Garman

Nasal valves each with anterior and posterior nasal cirrus. First dorsal inserted before midlength, smaller than second dorsal.

PENTANCHUS INDICUS (Brauer)

Scylliorhinus indicus BRAUER, Deutsch. Tiefsee Exped. *Valdivia*, vol. 5, Tiefsee-fische, p. 8, pl. 14, fig. 1, 1906 (type locality: Lat. 2°58′8″ N., long. 47°6′1″ E., in 1,289 meters, off East Africa; lat. 13°1′ N., long. 47°10′19″ E., in 1,840 meters, Gulf of Aden).—LLOYD, Mem. Indian Mus., vol. 2, p. 1139, 1909 (Gulf of Oman).

Scyliorhinus indicus REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 459, 1908 (copied).

Apristurus indicus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 87, 1913 (compiled).

Depth 5⅕ to subcaudal origin; head 3, width 1$\frac{7}{10}$ (as measured to last gill opening). Snout 1¾ (head measured to first gill opening), spatulate, broadly rounded in front; eye 7¼, 4 in snout, given as 1$\frac{9}{10}$ in interorbital though figure appears to show little over 2; labial fold halfway in jaw; teeth moderately large, 5 pointed with lateral points smaller than median; internasal equals orbit, space between hind nasal edge and mouth ½ orbit; cirrus on anterior and posterior nasal flap. Last 2 gill openings above pectoral base. Spiracle close behind eye edge, lower edge apparently little lower than lower eye edge.

Scales tricuspid.

First dorsal inserted little before midlength (on figure), length of front edge 2¼ in head; second dorsal inserted above middle of anal base, front edge 1⅞; anal length 1⅖; caudal 2⅛ in rest of body, subcaudal little lower than anal, notched little before last fourth; pectoral 1⅗ in head, width ½ its length; ventral 1¾ in head.

Brownish black. Eye greenish. Length, 132 to 336 mm. (Brauer.)

Indian Ocean off East Africa and Gulf of Aden.

PENTANCHUS SIBOGAE (Weber)

Scyliorhinus sibogae WEBER, *Siboga* Exped., Fische, vol. 57, p. 595, 1913 (type locality: Makassar Straits, in 655 meters).

Apristurus sibogae FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 485, 1930 (reference).

Depth 11 in total length; head (measured to last gill opening) 4$\frac{1}{10}$, depressed, width 1$\frac{7}{10}$. Snout 2 in head (measured to last gill opening), spatulate; eye 7, 3 3/10 in snout, 1 3/5 in interorbital; lower labial fold extends halfway to symphysis; teeth tridentate, moderately large, laterals pointed, in upper jaw smaller than median, in 4 rows; nasal valves not separate, anteriorly and posteriorly each with cirrus; internarial space greater than eye, space between hind nostril edge and upper jaw 3/4 eye. Last 2 gill openings above pectoral base. Spiracle half below and behind eye, smaller than pupil.

Scales tricarinate.

Dorsals small, first begins little behind vent, second larger and ends over second 2/5 of anal base; anal broad, begins shortly behind ventral base or little behind first dorsal origin, ending opposite hind basal end of second dorsal, base nearly equals head length to first gill opening; subcaudal anteriorly high as anal; pectoral broad, foliate, nearly equals head without snout; ventral inserted before middle of body, foliate, smaller than anal, base less than snout length. Vent behind ends of ventrals and before midlength.

Dull reddish white. Length, 228 mm. (Weber.)

Makassar Straits, Celebes.

PENTANCHUS MICROPS (Gilchrist)

Scyliorhinus microps Gilchrist, Marine Biol. Surv. South Africa, Spec. Rep. No. 2, pt. 3, p. 46, pl. 7, fig. 1, 1922 (type locality: Off Table Bay, in 790 fathoms).

Scylliorhinus microps Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 41, 1925 (type).

Depth 5 1/4 to subcaudal origin; head 3 1/8. Snout 1 3/4 in head, flattened; eye 6 1/2, 3 1/4 in snout; preoral length 1 3/4 in head; lower labial fold reaches half way to symphysis of mandible; interorbital little elevated. Gill openings apparently subequal, equidistant, last 2 above pectoral base (Gilchrist wrongly says above basis of ventral). Spiracle close behind eye, lower edge slightly below lower eye edge, length 1/2 orbital diameter.

Scales not noticed.

First dorsal along front edge 2 1/10 in head, inserted slightly behind vent, ends over front end of anal base; front edge of second dorsal 1 9/10, origin over middle of anal; caudal length 1 4/5 in rest of body, subcaudal deepest anteriorly though slightly lower than anal, and notched about last fifth; pectoral 1 3/4 in head; ventral 2 1/3.

Uniform dark, lighter above, black with tinge of purple below. Length, not given. (Gilchrist.)

South Africa.

Genus ATELOMYCTERUS Garman

Atelomycterus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 100, 1913. (Type, *Scyllium marmoratum* Bennett, monotypic.)

Ateleomycterus Fowler, Mem. Bishop Mus., vol. 10, p. 17, 1928. (Type, *Scyllium marmoratum* Bennett.) (Error.)

Body elongate, slender, body cavity short, tail longer. Eye large, orbit long; lower lid well differentiated, upper edge closing inside upper lid, with fold and apparently translucent or semitranslucent. Mouth angles with long labial folds, jaws strong. Teeth small, tricuspid, median cusp longest. Nostrils nearly midway in preoral length, with rudimentary groove to mouth, without cirri; front valves reaching mouth in rounded lobes, separated by median attachment in front of symphysis of jaws; no posterior valves. Gill openings moderate, last above pectorals. Spiracle small, close to eye. Dorsals larger than anal, origin of first dorsal above ventrals. Hind angles of dorsals and anals extended. Anal short. Subcaudal narrow, with prominent lobe. Pectorals small, rounded.

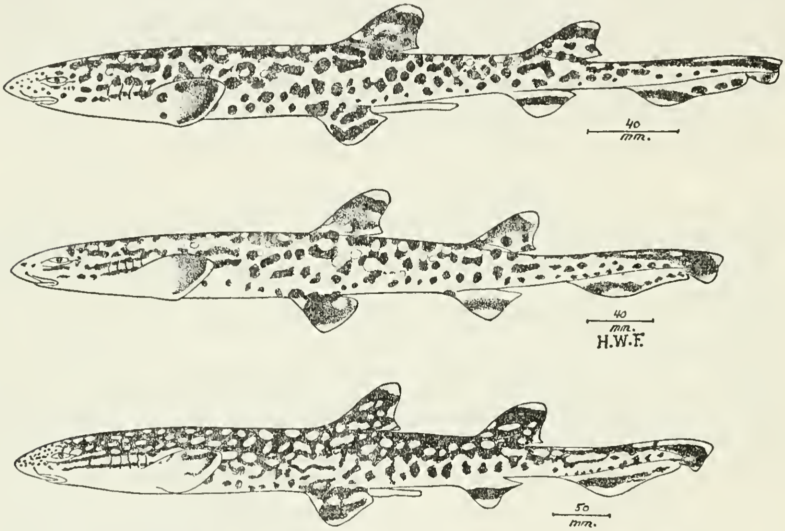
40 mm.
40 mm.
H.W.F.
50 mm.

Figure 6.—*Atelomycterus marmoratus* (Bennett): Variation of color pattern.

ATELOMYCTERUS MARMORATUS (Bennett)

Figure 6

Scyllium marmoratum Bennett, Life of Raffles, p. 693, 1830 (type locality: Sumatra).—Andrew Smith, Proc. Zool. Soc. London, 1837, p. 85 (reference).—Günther, Cat. Fishes Brit. Mus., vol. 8, p. 400, 1870 (Singapore; Sumatra, East Indies, India, type of *Scyllium maculatum* Gray).—Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 115, 1874 (Chinese drawing).—Martens, Preuss. Exped. Ost Asien, p. 409, 1876 (Singapore).—Day, Fishes of India, pt. 4, p. 724, pl. 190, fig. 2, 1878 (Hardwicke's example.)—Meyer, Anal. Soc. Españ. Hist. Nat. Madrid, vol. 14, p. 48, 1885 (Manado, Celebes, Macassar).—Day, Fauna British India, vol. 1, p. 31, fig. 11, 1889.—Elera, Cat. Fauna Filip., vol. 1, p. 616, 1895 (Manila, Luzon).—Dunker, Mitt. Naturh. Mus. Hamburg, vol. 21, p. 192, 1904 (locality?).—Volz, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 238, 1907 (Sumatra?).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^e note, p. 65, 1929 (Phuroc-bai).

Scylliorhinus marmoratus **Steindachner**, Ann. Hofmus. Wein, vol. 11, p. 227, 1896 (Bangkok).—**Weber**, *Siboga* Exped., Fische, vol. 57, p. 595, 1913 (Sapeh Strait, Sulu, Saleyer).

Scyliorhinus marmoratus **Regan**, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 462, 1908 (India, Malay Archipelago, type of *Scyllium maculatum* Gray).

Atelomycterus marmoratus **Garman**, Mem. Mus. Comp. Zool., vol. 36, p. 100, 1913 (India, Malay Archipelago).—**Herre**, Philippine Journ. Sci., vol. 26, No. 1, p. 123, 1925 (Sitanki; Dicuayan).—**McCulloch**, Australian Mus. Mem., vol. 5, pt. 1, p. 9, 1929 (North Australia).—**Fowler**, Hong Kong Nat., vol. 1, p. 30, fig. 3, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference).—**Chevey**, Inst. Océanogr. Indochine, 19^e note, p. 5, 1932 (Indochina).—**Whitley**, Rec. Austral. Mus., vol. 18, p. 322, pl. 38, fig. 1a–c, 1932 (Port Darwin).—**Herre**, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 10, 1934 (Dumaguete; Linapacan; Siasi; Sitanki).—**Whitley**, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).—**Roxas** and **Martin**, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 11, 1937 (reference).

Ateleomycterus marmoratus **Fowler**, Mem. Bishop Mus., vol. 10, p. 17, 1928 (compiled); List Fish. Malaya, p. 6, 1938 (reference) (error).

Scyllium maculatum (not Schneider) **Gray**, Illustr. Indian Zool. Hardwicke, vol. 1, pl. 98, fig. 1, 1832 (India).—**Müller** and **Henle**, Syst. Beschr. Plagiostomen, p. 5, pl. 7, 1841 (Indian Ocean).—**Richardson**, Rep. Brit. Assoc. Adv. Sci. for 1845, 15th meeting, p. 193, 1846 (China Sea; Canton).—**Cantor**, Journ. Asiatic Soc. Bengal, vol. 18, p. 1373, 1849 (Singapore, Indian Ocean, China Sea, Canton).—**Bleeker**, Nat. Tijdschr. Nederland Indië, vol. 3, p. 740, 1852 (Macassar; as a new species); Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 16, 1852 (Batavia); Nat. Tijdschr. Nederland. Indië, vol. 6, p. 314, 1854 (Larantuka, Flores); vol. 8, p. 344, 1855 (Duizend Islands); Act. Soc. Sci. Indo.-Néerl., vol. 1, no. 3, p. 8, 1856 (Macassar); vol. 1, no. 5, p. 8, 1856 (Amboina); Nat. Tijds. Nederland, Indië, vol. 15, p. 221 (Biliton), p. 243 (Singapore), 1858; Act. Soc. Sci. Ind. Néerl., vol. 6, no. 2, p. 3 (Doreh, New Guinea); (Sumatra), p. 12 (Benculen) 1859; Nat Tijdschr. Nederland. Indië, vol. 20, p. 331, 1859–60 (Amboina); vol. 22, p. 110, 1860 (Buru); Versl. Meded. Akad. Wet. Amsterdam, vol. 15, p. 20, 1863 (Hitu, Amboina); Nederland, Tijdschr. Dierk., vol. 1, p. 151 (Batjan), p. 264 (Atapupu, Timor), 1863.—**Duméril**, Hist Nat. Elasmobr, vol. 1, p. 319, 1865 (Seas Indian Archipelago, Amboina, Batavia).—**Kner**, Reise *Novara*, Fische, p. 412, 1865 (Java, Singapore).—**Elera**, Cat. Fauna Filip., vol. 1, p. 616, 1895 (Cavite, Luzon).

Scyllium ornatum **Gray**, Illustr. Indian Zool. Hardwicke, vol. 1, pl. 98, fig. 2, 1832 (type locality: China).—**Jouan**, Mém. Soc. Imp. Sci. Nat. Cherbourg, ser. 2, vol. 3, p. 276, 1868 (Hongkong).

Scyllium pardus (Temminck) **Müller** and **Henle**, Syst. Beschr. Plagiostomen, p. 5, 1841 (name in synonymy).

Depth 7⅗ to subcaudal origin; head 5⅗, width slightly less than length. Snout 2⅖ in head; eye 5⅖, 2⅕ in snout; mouth width 2⅛, mouth length 2¾ its width; long labial folds around mouth angles; nostrils small, midway in preoral, front valves reach mouth in rounded lobes and separated by broad median attachment; interorbital convex. Gill openings small, equidistant, last 2 above pectoral base. Spiracle small, close behind eye.

Scales small, sharp, with strong median cusp and rudimentary lateral cusps.

First dorsal inserted above middle of ventral, front edge 1⅓ in head; second dorsal inserted above forward half of anal, front edge 1¼ in head; anal smaller than second dorsal, front edge 1¾ in head; caudal 3⅓ in rest of body, subcaudal little lower than anal; pectoral 1⅖ in head, width 1⅘ its length; ventral 1½; clasper rather long, slender, styliform.

Light brownish. Young with about 12 transverse bands of brown on back, separated by pairs of white spots or light blotches. Fins with dark brown blotches and white ends. Lower surfaces whitish. With age more irregularly spotted and blotched with brown, less banded, white spots retained as brown edged ocelli. Males, 478 mm.; females, 503 mm. (Day, Garman.)

India, Malay Peninsula, Singapore, East Indies, Siam, Philippines, Indo-China, China. From Philippine waters previously known only from Elera's references.

A432. Jolo, in lobster pots. March 6, 1908. Length, 455 mm.
A4895. Siasi Island market. February 17, 1908. Length, 605 mm.
A1415. Makassar market, Celebes. December 22, 1909. Length, 695 mm.

Genus HAPLOBLEPHARUS Garman

Haploblepharus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 101, 1913. (Type, *Scyllium edwardsii* Cuvier, monotypic.)

Body short, caudal portion larger. Head broad, depressed. Snout short, rather pointed. Eye moderate, orbit elongate, lower lid not attached within upper lid, but closing against it, without fold. Mouth moderate, with strong labial fold around angles. Teeth minute, numerous, each with strong median and weaker lateral cusps. Nostrils nearer mouth than snout end, with nasoral grooves, without cirri, without posterior valves; anterior valves reach mouth in wide angular flap, forming broad lip narrowly attached in middle. Gill openings moderate, last narrow and above pectoral. Spiracle small, close to eye. Hind angles of dorsals and anal not produced. Subcaudal small, without prominent lobe.

HAPLOBLEPHARUS EDWARDSII (Müller and Henle)

Scyllium edwardsii (Cuvier) Andrew Smith, Proc. Zool., Soc. London, 1837, p. 85 (name only).—Müller and Henle, Syst. Beschr. Plagiostomen, p. 4, pl. 1, 1841 (type locality: Cape of Good Hope).—Gray, Cat. Fishes British Mus., p. 28, 1851 (Cape of Good Hope).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 319, 1865 (Cape of Good Hope).—Günther, Cat. Fishes British Mus., vol. 8, p. 401, 1870 (Cape of Good Hope).

Scyliorhinus edwardsii Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 463, 1908 (South Africa); Ann. Natal Gov. Mus., vol. 1, p. 241, 1908 (Bird Island).—Clarke, Rep. Sci. Res. *Scotia*, Scot. Nat. Antarct. Exped., vol. 4, p. 394, 1915 (Houties Bay and off Salamander Point; entrance Saldanha Bay).

Scylliorhinus edwardsii GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 283, 1916 (references).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 41, 1925 (Saldanha, Table and False Bays, Agulhas Bank).

Haploblepharus edwardsii GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 102, 1913 (South Africa).

Scyllium pictum MÜLLER and HENLE, Syst. Beschr. Plagiostomen, pp. 4, 189, 1841 (type locality: Cape of Good Hope).

Depth 7½ to subcaudal origin; head 7, rather broad, depressed. Snout 2⅖ in head; orbit 5, 2⅕ in snout, narrowly elongate; preoral length half mouth width; mouth length ⅓ its width, with moderate labial folds around angles; teeth tricuspid, median cusp twice long as outer; nostrils small, nearer mouth than snout tip, nasoral groove deep to mouth; front nasal valves without cirri, reach mouth, form broad angular lip with narrow median presymphyseal attachment; interorbital level. Gill openings equidistant.

Scales tricarinate, with strong median cusp and short lateral cusp each side.

First dorsal origin behind basal ventral end, front edge 1⅓ in head; second dorsal origin opposite hind basal anal edge, front edge 1¼ in head; anal length 1, front edge 1⅗; caudal 3⅘ in rest of body, subcaudal trifle lower than anal, notch little before last fourth in caudal length; pectoral long as head, reaches slightly over halfway to ventral, width 1⅗ its length; ventral length nearly equals head; claspers attenuate.

Light yellowish brown, with broad, irregular, transverse darker bands on back, small brown reticulations or small yellowish spots on back and fins. Band crosses hind part of orbit, another last gill slit, third at pectoral ends, one through each dorsal and caudal peduncle. Below lighter, uniform. Length, 484 mm. (Müller and Henle; Garman.)

South Africa. Barnard gives its length up to 520 mm.

Genus PROSCYLLIUM Hilgendorf

Proscyllium HILGENDORF, Sitz. Ber. Naturf. Freunde Berlin, 1904, p. 39. (Type, *Scyllium habereri* Hilgendorf, monotypic.)

Head elongate. Snout long. Mouth large. Front nasal valves separate from one another and from mouth. Dorsals small, inner angle produced, first dorsal in part forward of ventrals. Anal long, remote from subcaudal. Pectorals small.

An imperfectly known genus, thought by Garman to approach *Galeus* rather than *Scyliorhinus*.

PROSCYLLIUM HABERERI (Hilgendorf)

Scyllium habereri HILGENDORF, Sitz. Ber. Naturf. Freunde Berlin, 1904, p. 39 (type locality: Takao, Formosa), *Proscyllium habereri* Garman, Mem. Mus. Comp. Zool., vol. 36, p. 103, 1913 (Takao).—J. Schmidt, Compt. Rend. Acad. Sci. U. S. S. R., 1930, p. 627, figs. 1–2 (type; Japan); Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 4, 1931 (Kagoshima).

Proscyllium haberi Jordan, Tanaka, and Snyder, Journ. College Sci. Tokyo, vol. 33, p. 8, 1913 (Kagoshima; Formosa). (Error.)

Poroscyllium habereri Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference) (error).

Depth 8¾ to subcaudal origin; head 6, width 1⅕. Snout 1¼ in head; eye 4, 1⅞ in snout, without nictitating membrane; mouth width 2 in head, length ⅓ its width, labial folds very short, rudimentary, only at mouth angles; preoral 2⅘ in head; teeth tricuspid, symmetrical, median cusp strongest, sometimes with 2 more cusps, all nearly same size, 28 rows above; nostrils slightly oblique, internarial slightly less than hind border of each valve; interorbital moderately equidistant, last smallest and above pectoral base.

Scales very small, tricuspid, with short median spines.

First dorsal entirely before ventrals, front edge 1½ in head, second dorsal origin little behind anal origin, front edge 1⅖ in head; anal length 2⅒; pectoral 1⅛, width about ½ length which not quite to first dorsal origin or little less than half way to ventral origin; ventral length 1⅖ in head; caudal 4⅓ in rest of body, subcaudal little deeper than anal, front edge 2⅛ in head, notch at last third.

Gray-brown, yellowish on belly. Distinct brown crossbands on upper side, each spotted with 3 to 5 rows of round dark brown spots and interchanging with lighter bands having less spots and more narrow; first dark band between eyes, 5 behind eyes to first dorsal, 4 between dorsals, 1 below second dorsal and 2 on caudal. Some more diffuse dark spots on lower parts of sides. Snout, both dorsals, pectorals and caudal above with round dark spots. Under surface immaculate. Length, 670 mm. (J. Schmidt.)

Formosa, Japan.

Family ORECTOLOBIDAE

Body short, partly cylindrical to moderate and depressed. Tail long and slender with short caudals to rather short with long caudals. Head narrow. Snout very short to wide. Eyes small, without nictitating membrane. Mouth transverse, with labial folds around angles on both jaws. Teeth compressed, with or without lateral cusps at each side of median. Nostrils with nasoral grooves and cirri on anterior nasal valves. Gill openings small to moderate, last 2 or 3 above pectoral. Spiracle minute and behind eye to large and more or less below eye. Fins short and broad, except caudal, which often narrow and not lobed. No fin spines. No caudal pits.

A large family of oviparous or viviparous sharks, variously pelagic, some bathypelagic or littoral. Their food is largely marine bottom dwelling animals, especially invertebrates and fishes. Most are of small size in the Indo-Pacific, a few in the Atlantic. Several reach upward of 12 or more feet. Several features of divergence in adaptation are noteworthy. Thus the nurse sharks (*Ginglymostoma*) like other pelagic forms are of nearly uniform coloration. The wobbegongs (*Orectolobus*) are bottom forms variously mottled and many with skinny flaps, living among weeds and rocks, somewhat suggestive of the so-called angel sharks (*Squatina*). Other forms, as species of *Stegostoma* and *Hemiscyllium*, are brilliantly contrasted when young, though they become more subdued or uniform with age. Tropical littoral forms (*Hemiscyllium*, *Brachaelurus*, *Chiloscyllium*, *Stegostoma*) are strikingly barred, spotted, or variably marked, often in great contrast.

ANALYSIS OF GENERA

a^1. Spiracles very small; anal distinct or well separated from caudal, opposite or before second dorsal.
  b^1. Nebriinae. Gill openings subequal; second dorsal origin above or before anal -- Nebrius
  b^2. Parascylliinae. Last gill opening largest; second dorsal origin behind anal origin or even behind anal base.
    c^1. Short barbel on throat; second dorsal over last half of anal length. Cirrhoscyllium
    c^2. Throat without barbel; second dorsal behind anal -------- Parascyllium
a^2. Spiracles large; anal close to subcaudal or only separated by narrow notch, behind second dorsal.
    d^1. Spiracle below level of eye; caudal usually short, not over ⅓ total length.
      e^1. Hemiscylliinae. Teeth similar, small, tricuspid, arranged in many series; head without dermal lobes.
        f^1. Tail short, not over ⅓ longer than combined head and trunk; ovoviviparous ------------------------------ Brachaelurus
        f^2. Tail long, not less than ½ longer than combined head and trunk; oviparous ---------------------------------- Hemiscyllium
      e^2. Orectolobinae. Teeth unlike in jaws, in front long, slender, and smooth, laterals small, tricuspid and in few series; sides of head and snout with more or less interrupted rows of dermal flaps; ovoviviparous ---------------------------------- Orectolobus
    d^2. Stegostominae. Spiracle behind eye; caudal ½ or even slightly over ½ total length; coloration variegated, young with contrasted numerous black cross bands ------------------------------ Stegostoma

Genus NEBRIUS Rüppell

Nebrius Rüppell, Neue Wirbelth., Fische, p. 62, 1835. (Type, *Nebrius concolor* Rüppell, monotypic.) (*Nebria* Latreille and *Nebris* Cuvier not involved.)

Ginglymostoma Müller and Henle, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 113. (Type, *Squalus cirratus* Gmelin, Arch. Naturg., 1837, p. 396: Designated by Hay, U. S. Geol. Surv. Bull. 179, p. 310, 1902.)

Ginglimostoma Agassiz, Poiss, fossiles, vol. 3, p. 85, 1838. (Type *Squalus cirratus* Gmelin.)

Plicodus Winkler, Arch. Mus. Teyler, vol. 3, p. 301, 1874. (Type, *Plicodus thielensis* Winkler, monotypic.) (Fossil.)

Acrodobatis Leidy, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 8, p. 250, 1877. (Type, *Acrodobatis serra* Leidy, designated by Hay, U. S. Geol. Surv. Bull. 179, p. 310, 1902.) (Fossil.)

Acrodontobatis Leidy, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 8, p. 250, 1877. (Type, *Acrodobatis serra* Leidy.) (Fossil.)

Nebrodes Garman, Mem. Mus. Comp. Zool., vol. 36, p. 56, 1913. (Type, *Nebrius concolor* Rüppell.)

Body moderate, depressed and broadened forward, compressed posteriorly. Head broad. Snout short, obtuse. Eyes small, without fold. Mouth wide, little curved, inferior. Teeth small, compressed, cusps 3 to 5 or more, often strong sharp median cusp at each side of which pair of denticles, several rows in function. Nostrils near snout end; front nasal valves reach mouth, broadly separated by attachment across symphysis, each with cylindrical cirrus at outer edge; hind valve fold on outer side of groove. Gill openings moderate, fourth and fifth close together, widest and above pectoral. Spiracle minute, at distance behind eye. Dorsals approximated, rather large, first above ventrals, larger, second dorsal origin forward of anal. Caudal large, subcaudal not lobed.

Species of tropical seas, pelagic. Some reach a large size, frequent shallows, often associating in small schools and found drowsing near the surface.

ANALYSIS OF SPECIES

a^1. Ginglymostoma. Tail moderately long; teeth mostly tricuspid.
  b^1. Angles of fins rounded; pectorals reach less than halfway to ventrals. **brevicaudatus**
  b^2. Angles of fins pointed; pectorals reach over halfway to ventrals. **ferrugineus**
a^2. Nebrius. Tail long; teeth multicuspid; angles of fins pointed.
  c^1. Ventral length more than half space to anal origin; caudal length more than half rest of body .... **concolor**
  c^2. Ventral length 2⅛ to anal origin; caudal length more than half rest of body .... **macrurus**

Subgenus Ginglymostoma Müller and Henle

NEBRIUS BREVICAUDATUS (Günther)

Ginglymostoma brevicaudatum Günther, Fishes of Zanzibar, p. 141, pl. 21, 1866 (type locality: Zanzibar); Cat. Fishes Brit. Mus., vol. 8, p. 408, 1870 (type; Seychelles).—Regan, Proc. Zool. Soc. London, 1908, p. 351 (type; Seychelles).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 55, 1913 (Zanzibar, Seychelles, Indian Ocean).

Depth 8⅕ to subcaudal origin; head 6, width 1⅕. Snout 2½ in head; eye 20, 8 in snout, 13 in interorbital; mouth wide, labial folds crossing half or more of space from angles to symphysis on lower jaw and little less on upper; teeth small, in example 586 mm. long, 29 rows above, 27 below, several rows functional, usually with strong hooked median cusp with denticle each side; nostrils small, front valves reaching lip, separated by very broad preoral attachment, cirrus half long as valve, hind valve fold on outer side of nasoral groove; interorbital $1\frac{2}{3}$ in head, nearly level. Last 2 gill openings together and close above pectoral base, others equidistant.

Scales small, with quadrangular exposure, with 3 to 9 scales or smooth hinder edges notched by keels or entire.

First dorsal inserted over middle of ventral base, front edge equals head; front edge of second dorsal $1\frac{1}{8}$; anal origin opposite first $\frac{2}{5}$ of second dorsal base, front edge $1\frac{1}{5}$ in head; pectoral $2\frac{1}{3}$ to ventral origin, width $1\frac{1}{3}$ its length which equals head; ventral length $1\frac{1}{5}$; caudal 3 in rest of body, front and subcaudal edge equals head.

Dark brown above, with minute black dots. Lower surface brownish white. Length, 635 mm. (Günther; Garman.)

Zanzibar, Seychelles.

NEBRIUS FERRUGINEUS (Lesson)

Scyllium ferrugineum Lesson, Voy. *Coquille*, Zool., vol. 2, pt. 1, p. 95, 1830 (type locality: Port Praslin, New Ireland; Offack Bay, Waigiu).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 14, 1852 (reference).

Ginglymostoma ferrugineum Regan, Proc. Zool. Soc. London, 1908, p. 351 (compiled).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 56, 1913 (India; East Indies).—Fowler, Mem. Bishop Mus., vol. 10, p. 18, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference); Mem. Bishop Mus., vol. 11, no. 5, p. 314, 1931 (reference).—Chevey, Inst. Oceanogr. Indo Chine, 19^{e} note, p. 5, 1932 (Poulo Condore).—Fowler, Mem. Bishop Mus., vol. 11, no. 6, p. 385, 1934 (Port Moresby, New Guinea); List Fish. Malaya, p. 6, 1938 (reference).

Ginglymostoma concolor (not Rüppell) Müller and Henle, Syst. Beschr. Plagiostomen, p. 22, pl. 6, 1841 (India; Red Sea).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).—Martens, Preuss. Exped. Ost Asien, vol. 1, p. 409, 1876 (Singapore).—Macleay, Proc. Linn. Soc. New South Wales, vol. 7, p. 597, 1883 (New Guinea).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 7, 1888 (Purves Sound, Solomons).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 511, 1891 (reference).

Ginglymostoma mülleri Günther, Cat. Fishes British Mus., vol. 8, p. 408, 1870 (type locality: India) (on Müller and Henle).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 670, 1871 (Red Sea).—Schmeltz, Cat. Mus. Godeffroy, no. 6, p. 18, 1877 (Samoa).—Day, Fishes of India, pt. 4, p. 725, 1878 (India).—Brusina, Glasnik Naravosl. Družtva, vol. 3, p. 226, 1888 (Red Sea).—Day, Fauna British India, vol. 1, p. 33, 1889.—Günther, Journ. Mus. Godeffroy, pt. 17, p. 487, 1910 (Samoa).—Pearson, Ceylon Administr. Rep., 1912–13, p. E7.—Tirant, Service Océanogr. Pêches Indo-Chine, 6^{e} note p. 65, 1929 (Poulo Condar; Cholon).

Scymnus porosus (Ehrenberg) Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 670, 1871 (name in synonymy).—Hilgendorf, Symbol. Physic. Hemprich-Ehrenberg, p. 8, pl. 6, fig. 3, 1899 (type locality: "Mari rubro").

Depth 7½ to subcaudal origin; head 5⅓, width 1⅛. Snout 2⅓ in head; eye 11, 5 in snout; mouth width, outside labial folds, 2¼ in head; teeth small, with strong median cusp and 3 to 5 smaller lateral cusps, several rows in function; front nasal valves reaching mouth, cirrus much shorter, hardly half long as valve; interorbital convex. Last 2 gill openings together above pectoral base, others equidistant.

Scales small, with obtuse central keel, hind edge crenulated.

First dorsal origin opposite ventral origin, front edge 3½ in body to subcaudal origin; front edge of second dorsal 1⅛ in head; anal inserted slightly behind second dorsal, front edge equals head; ventral length 1⅓; pectoral reaches 1½ to ventral, width 1⅞ its length which 4¼ in length to subcaudal origin; caudal 3⅙, subcaudal front edge 1⅔ in head, notch at last sixth in subcaudal.

Uniform rusty brown. Length, 2593 mm. (Müller and Henle; Garman.)

Red Sea, Madagascar, India, Singapore, East Indies, Indo-China, Melanesia, Polynesia.

Subgenus NEBRIUS Rüppell

NEBRIUS CONCOLOR Rüppell

Nebrius concolor RÜPPELL, Neue Wirbelth., Fische, p. 62, pl. 17, fig. 2, 1835 (type locality: Massaua).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 597, 1883 (reference).—OGILBY, Mem. Queensland Mus., vol. 2, p. 90, 1913 (Darnley Island); vol. 5, p. 75, 1916 (Darnley Island).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference); List Fish. Malaya, p. 8, 1938 (reference).

Ginglymostoma concolor CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1377, 1849 (Pinang).—DUMÉRIL, Rev. Mag. Zool., ser. 2, vol. 5, p. 126, 1853 (compiled).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 344, 1863 (Madagascar).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 409, 1870 (Java, Pinang).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 672, 1871 (Koseir, Red Sea).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 597, 1883 (Port Moresby, New Guinea).—DAY, Fishes of India, Suppl., p. 811, fig., 1888 (Red Sea, India, Malay Archipelago).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 7, 1888 (Purves Sound, Solomon Islands).—BRUSINA, Glasnik Naravosl. Družtva, vol. 3, p. 226, 1888 (Red Sea).—DAY, Fauna British India, Fishes, vol. 1, p. 32, fig. 12, 1889 (copied).—REGAN, Proc. Zool. Soc. London, 1908, p. 352 (Java; Pinang).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, p. E49.—PEARSON, Ceylon Administr. Rep., 1915–18, p. E15.

Nebrodes concolor GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 57, 1913 (Red Sea to India).

Ginglymostoma rüppellii BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 91, 1852 (type locality: Singapore); Nat. Tijds. Nederland Indië, vol. 3, p. (54) 83, 1852 (Singapore).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 334, 1865 (compiled).

Nebrodes concolor ogilbyi WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 183, fig. 1, p. 198 (reference), 1934 (type locality: Darnley Island, Queensland).

Depth 5⅘ to subcaudal origin; head 4⅖, width little over half its length. Snout 2 in head; eye 12, 5 in snout; preoral length 4½ in head, little over half mouth width; labial folds well developed, widely separated across symphyseal space; teeth multicuspid, cusps subequal or graduated to strongest, which not median one; nasal cirrus extends to oral edge of nasal valve; interorbital moderately elevated. Last 2 gill openings closer, above pectoral, others equidistant. Spiracle minute, close behind eye.

Fins pointed; first dorsal origin opposite ventral origin, fin length 1⅛ in head, base length greater than interdorsal space; second dorsal length 1⅔ in head; anal length 1⅞, origin opposite middle of second dorsal base; pectoral 1⅓, width 1⅞ its length which half way to ventral; ventral length 1⅗ in head; caudal 1⅞ in rest of body, front edge of subcaudal 1½ in head, notch beyond last eighth its length.

Brownish. Length, 700 mm. (Regan; Rüppell.)

Red Sea, Madagascar, India, Ceylon, Pinang, Singapore, East Indies, Queensland, Melanesia. I am uncertain of Garman's *Nebrodes macrurus* as a distinct species. The main distinction he gives is its greater interdorsal space. Truly, in Rüppell's original figure of *Nebrius concolor* this is shown as not equal to the base length of the first dorsal, but then I can not help but suspect this may be an error of the artist. This is surely likely if we consider the comparative crudeness of Rüppell's figures. In 1888 Day gives a figure, though crude in many ways, that is still closer to Garman's and is especially in agreement with its greater extent of the interdorsal space. Regan in 1908 in listing an example of 660 mm. from Java and one 700 mm. stuffed, from Pinang, gives a description in which he states the base length of the first dorsal is greater than the distance from the second. Though Day says the "caudal fin one-third of the total length," he shows it in his figure as 3⅞. Garman's reference to "Rüppell, 1837, Beschr. Chondropt., p. 2, pl. 17, fig. 2" I have not seen. Though he gives 1838 for the "Fische des rothen Meeres," my copy is dated 1835.

NEBRIUS MACRURUS (Garman)

Nebrodes macrurus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 58, pl. 8, figs. 7-10, 1913 (type locality; Port Louis Harbor, Mauritius).

Depth 6 to subcaudal origin; head 5⅔. Snout 2 in head, short, blunt; eye 11½, 5¾ in snout; 5 in mouth width; mouth moderate, nearly transverse, nearer snout end than eye; labial folds strongly developed, widely separated across symphyseal space; teeth in 30 rows above, 28 below, one transverse series functional, much compressed, each with low median cusp at each end of which 4 or more smaller ones gradually decreasing in size toward outer; nostrils near snout end, front nasal valve with long cylindrical cirrus and posterior valve fold on side of nasoral groove; interorbital well convex. Last 2 gill openings together, above pectoral, others equidistant. Spiracle minute, distant from hind eye edge one eye diameter.

Scales small, rather smooth to touch, with low median keel, with or without smaller lateral keels, larger scales intermixed with smaller, hinder edges not crenulate.

First dorsal origin above first ⅖ of ventral base, front fin edge 1¼ in head; front edge of second dorsal 1½; anal origin opposite first third of second dorsal base, front edge 1¼ in head; pectoral little longer than head to first gill opening, width 1¾ its length, which reaches 1⅞ to ventral; ventral length 1⅖ in head; caudal 2$\frac{1}{10}$ in rest of body, front subcaudal edge 1⅓ in head, notch at last sixth.

Rusty brownish, with sprinkled appearance, from larger whiter scales. Length, 788 mm. (Garman.)

Mauritius.

Genus CIRRHOSCYLLIUM Smith and Radcliffe

Cirrhoscyllium Smith and Radcliffe, Proc. U. S. Nat. Mus., vol. 45, p. 568, 1913. (Type, *Cirrhoscyllium expolitum* Smith and Radcliffe, orthotypic.)

Zev Whitley, Rec. Australian Mus., vol. 15, No. 5, p. 290, 1927. (Type, *Cirrhoscyllium expolitum* Smith and Radcliffe, virtually. *Zev* Whitley proposed to replace *Cirrhoscyllium* Smith and Radcliffe. *Cirrhiscyllium* Ogilby, 1908, not involved.)

Body very elongate, slightly compressed, abruptly elevated at nape, thence tapering regularly to tail. Head wide, depressed. Snout flat, tip obtusely rounded. Eye small, lateral, surrounded by well developed naked fold, most evident below. Mouth wide, slightly curved, anterior to eye; well developed fold at angle extending to symphysis of lower jaw. Teeth conic, with strong lateral cusps in both jaws. Nasal valves much convoluted. Pair of widely separated skin-covered, threadlike appendages on under side of throat. Four front gill slits very narrow, fourth opening on margin of anterior wall of fifth which very wide and above pectoral base. Spiracles minute, below and slightly behind hind angle of eye. Scales elongate, ovate, tricarinate. Dorsals small. Caudal long, subcaudal low. Pectoral short, broad.

CIRRHOSCYLLIUM EXPOLITUM Smith and Radcliffe

Cirrhoscyllium expolitum Smith and Radcliffe, Proc. U. S. Nat. Mus., vol. 45, p. 568, fig. 1 (dermal denticles), fig. 2 (teeth), pl. 45, 1913 (type locality: Lat. 21°33′ N., long. 118°13′ E., in 100 fathoms; China Sea between northern Luzon and China).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (reference).

Chiloscyllium expolitum Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 11, 1937 (reference).

Depth 9 to subcaudal origin; head 5½, width 1⅔. Snout 2⅓ in head, as seen from above rather widely triangular; eye 5, 2⅖ in snout, 2⅖ in interorbital, depth 1¾ its length; dentary width 3⅛ in head, with deep labial grooves around mouth angle, upper short and lower greatly longer or equals separation of folds across symphyseal space; teeth in 24 rows in jaws, compressed, tricuspid, cusps as larger median and small basal one each side, edges entire; nostrils about last fourth in preoral space, nasoral groove reaching mouth, front valve rounded flap little broader than internarial space and hind valve with border folded around nostril and with small external fleshy point or papilla; interorbital 2⅖, depressed, scarcely convex.

Gill openings small, fourth and fifth so close as almost to appear as one aperture and with third above level of pectoral base. Spiracle close behind and little below lower eye edge. Small barbel long as eye opposite hind eye edge each side of pharynx, covered with shagreen.

Scales moderately fine, triangular, each ends in point behind and with median keel.

First dorsal origin well behind ventral base, about midway between ventral and anal origins, front edge 1½ in head; second dorsal origin midway in anal length, front edge 1⅖ in head length; anal origin little nearer that of subcaudal than hind basal edge of ventral; subcaudal length greater than head to last gill opening or 1⅕ in caudal length, low or its height 11¾ in its length; pectoral width 1⅖ its length which 1⅕ in head; ventral length 1$\frac{1}{10}$.

Fawn color above, whitish below. Ten ill-defined or obscure slightly darker saddles on back. As seen from above pectorals and ventrals with narrow whitish edges.

China Sea.

U.S.N.M. No. 74603. China Sea, *Albatross* Station 5310. Length, 332 mm. Type.

Genus PARASCYLLIUM Gill

Parascyllium GILL, Ann. Lyceum Nat. Hist. New York, vol. 7, pp. 408, 412, 1862. (Type, *Hemiscyllium variolatum* Duméril, orthotypic.)

Body long, slender, cavity less than half total. Head short. Snout short, blunt. Mouth with well-developed lower lip; no genial fold. Teeth small, lanceolate, median cusp larger, lateral cusps small or absent. Nostrils connected with mouth by nasoral grooves; front nasal valve with cirrus, widely separated by preoral attachment. Gill openings narrow, fourth and fifth close together above pectoral, fifth widest. Spiracle small, below hind part of orbit. Fins all small. First dorsal above space between ventrals and anal, second dorsal behind anal. Subcaudal short, not lobed.

Australia.

ANALYSIS OF SPECIES

a^1. No dark nuchal collar; body with scattered dark or dusky spots, without white spots; fins without contrasted large black blotches.
  b^1. Fins at least all with few dark spots; dark nuchal collar not contrasted. ferrugineum
  b^2. Fins with but few dark spots, none on pectoral; dark nuchal collar well contrasted-- collare
a^2. Dark nuchal collar closely spotted with white; body clouded with brown and white spots; fins with contrasted large black blotches-------- variolatum.

PARASCYLLIUM FERRUGINEUM McCulloch

Parascyllium ferrugineum McCulloch, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 7, pl. 2, fig. 2, text fig. 2, 1911 (mouth) (type locality: Outside Port Phillip, Victoria).—Waite and McCulloch, Trans. Proc. Roy. Soc. South Australia, vol. 39, p. 459, 1915 (Great Australian Bight).—Waite, Rec. South Australian Mus., vol. 2, no. 1, p. 17, 1921.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (reference).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 197, 1934 (reference).

Depth $10\frac{3}{4}$ to subcaudal origin; head 7, much depressed. Snout $2\frac{1}{3}$ in head, broadly rounded; eye $5\frac{1}{5}$, 2 in snout, with prominent fold below; preoral half mouth width, which $1\frac{3}{10}$ in snout; lower labial fold half way to symphysis, extends around mouth angle; teeth alike in jaws, small, flattened, triangular, acute, rounded projections on each side basally but not tricuspid; outer nasal fold with 2 or 3 small lobes posteriorly, outer longest and pointed; nasal cirrus short, thick, reaches lips; interorbital low, flat, depressed. Gill openings graduated larger to last, which $1\frac{3}{5}$ in snout and last 2 over pectoral base. Spiracle minute, placed half eye diameter behind eye.

Front edge of first dorsal $1\frac{1}{5}$ in head; of second dorsal $1\frac{1}{8}$; anal length $1\frac{1}{4}$; pectoral 1, width $1\frac{3}{4}$ its length which reaches $1\frac{4}{5}$ to ventral; ventral length $1\frac{1}{8}$ in head; caudal $4\frac{1}{10}$ in rest of body, subcaudal deep as anal, with notch little behind last fifth.

Grayish brown above, with indistinct darker crossbands; first narrow, between eyes, next broader and over gill openings, 2 more before first dorsal and one before second dorsal. Entire body with evenly spaced large brown spots which darkest on cross bars and become elongate on caudal; 3 similar spots each side of nuchal band. Fins also with similar spots, most numerous on dorsal. Length, 730 mm. (McCulloch.)

Victoria. According to McCulloch differs in its broader head, more rounded snout, larger fins, and different coloration.

PARASCYLLIUM COLLARE Ramsay and Ogilby

Parascyllium collare Ramsay and Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1310, 1888 (type locality: in deep water off Port Jackson).—Waite, Prelim. Rep. *Thetis* Exp., p. 38, 1898 (between Broken Bay and off Tuggerah Lakes, New South Wales, in 20 to 50 fathoms); Mem. Australian Mus., vol. 4, p. 32, pl. 2, fig. 2, 1899 (New South Wales); Rec. Australian Mus., vol. 6, pt. 3, p. 229, pl. 41, 1906 (Port Kembla and Botany Bay); vol. 7, p. 229, 1908 (oviposition).—Regan, Proc. Zool. Soc. London, 1908, p. 349 (Tasmania).—Ogilby and McCulloch, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 267, 1909 (type; Broken Head, New South Wales, in 28 fathoms).—McCulloch, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 7, 1911 (Shoalhaven Bight, New South Wales, in 15–45 fathoms).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 67, 1913 (Australia near Port Jackson).—McCulloch, Fishes New South Wales, ed. 2, p. 7, pl. 1, fig. 17a, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (reference).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 197, 1934 (reference).

Parascyllium variolatum (not Duméril) Günther, Cat. Fish. Brit. Mus., vol. 8. p. 410, 1870 (Tasmania).

Depth 9¼ to subcaudal origin; head 8⅓. Snout 2⅔ in head; eye 5, 2 in snout; lower labial fold extends half way to symphysis; outer nasal fold with small, supplementary cirruslike lobe; nasal cirrus very short, thick, not reaching mouth; interorbital moderately low, broad, flat, little longer than snout. Last gill opening greatly larger than others, close to fourth and both above pectoral base.

Front edge of first dorsal 1⅒ in head; of second dorsal 1; anal length 1⅕; pectoral 1, width about half its length which reaches 2⅕ to ventral; ventral length equals head length little beyond second gill opening; caudal 3¾ in rest of body, subcaudal little deeper than anal, with notch little before last fourth.

Light brown above, with broad dark brown nuchal collar, widest above extending from behind eyes to pectoral origin. Tip of snout and 2 small areas below eyes somewhat dark colored. Body with scattered darker spots, some very large and ill defined tend to form cross bars. Front part of tail with similar markings, posteriorly smaller spots absent and cross bands more distinct. Vertical fins and ventrals with some ill-defined spots but pectorals uniform. Length, 765 mm. (Ogilby and McCulloch.)

New South Wales, Victoria, Tasmania.

PARASCYLLIUM VARIOLATUM (Duméril)

Hemiscyllium variolatum Duméril, Rev. Mag. Zool., ser. 2, vol. 5, p. 121, pl. 3, fig. 1, 1853 (type locality: Tasmania); Hist. Nat. Elasmobr., vol. 1, p. 327, 1865 (type).

Parascyllium variolatum Gill, Ann. Lyceum Nat. Hist. New York, vol. 7, p. 413, 1862 (reference).—Günther, Cat. Fishes British Mus., vol. 8, p. 410, 1870 (Tasmania).—Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 115, 1874 (Chinese drawing).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 362, 1881 (Tasmania).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 7, 1888 (Hobart, Tasmania).—Regan, Proc. Zool. Soc. London, 1908, p. 349 (compiled).—Ogilby and McCulloch, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 269, 1909 (cotype of *Parascyllium nuchale* McCoy from Port Phillip).—McCulloch, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 7, pl. 2, fig. 1, 1911 (off Port Phillip Heads).—GARMAN, Mem. Mus. Comp. Zool. vol. 36, p. 67, 1913 (Australia).—WAITE, Rec. South Australian Mus., vol. 2, no. 1, p. 17, fig. 8, 1921.—FOWLER, Hong Kong Nat., vol. 1, p. 34, fig. 7, 1930 (Bleeker's record); Proc. 4th. (1929) Pacific Sci. Congr., Java, p. 487, 1930 (reference).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Parascyllium nuchalis McCOY, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 15, pl. 2, 1874 (type locality: Hobsons Bay near Melbourne).

Parascyllium nuchale MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 362, 1881 (Port Phillip).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 8, 1888 (Port Phillip).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, pp. 44, 1890 (reference).

Depth 10½ to subcaudal origin; head 8. Snout 2¾ in head, bluntly rounded; eye 7¼, 3 in snout; mouth small, midway in snout length, with labial folds around angle, without geneial fold across chin; teeth small, tricuspid in young; nostrils large, nasoral groove extends to mouth, with short cirri, widely separated by preoral frenum; interorbital low, flattened. Gill openings graduated back to last which largest or 1⅗ in snout, close to fourth and both above pectoral base.

Front edge of first dorsal $1\frac{1}{10}$ in head; of second dorsal 1; anal length 1⅕; pectoral 1, width 1⅔ its length which reaches half way to ventral; ventral length $1\frac{1}{10}$ in head; caudal 4¼ in rest of body, subcaudal depth little less than anal depth and notch at last fifth its length.

Body and fins clouded with brown, on former tending to form cross bands. Broad blackish brown nuchal collar extends from half way between eye and first gill opening to pectoral base. Back and sides with numerous white spots, which are very small and crowded on dark nuchal collar. Each fin with several large blackish blotches. Length, 700 mm. (Ogilby; McCulloch.)

Victoria, Tasmania, South Australia, South Western Australia. The type in the Paris Museum is said to measure 360 mm.

PARASCYLLIUM MULTIMACULATUM Scott

Parascyllium multimaculatum SCOTT, Pap. Proc. Roy. Soc. Tasmania, 1934, p. 63, pl. 5, fig. 1, 1935 (type locality: Tamar Heads, northern Tasmania).

Depth 8¼ to subcaudal origin; head to first gill opening 7⅗, width $2\frac{1}{10}$. Snout 2¼ in head; eye 5, 2⅗ in snout; preoral length 3⅘ in mouth width; lower labial fold extends half way to middle of jaw, continued well round angle of mouth; longitudinal fold beneath eye; nasal cirrus short, fairly thick, reaching lip; exterior nasal fold with short blunt lobe at hind external angle; 7 closely set rows of teeth above mesially, each tooth small, elongated, bulbous just above base, terminal half flattened, acute; lower teeth similar but with basal bulb sometimes forming pair of incipient lateral cusps; first gill slit 2⅓ in last, which 1⅓ in snout, fourth and fifth closest and over pectoral base. Spiracle minute, below and behind eye.

First dorsal slightly postmedian, front fin edge 1⅛ in head; second dorsal begins close behind anal base, front fin edge 1⅕ in head; caudal length 4¼ in rest of fish, and subterminal notch below about last fifth; anal length 1¼ in head; pectoral 1⅙; ventral 1¼.

Pale gray tinged with brown, almost white below, especially before ventrals. Ten rather indeterminate rusty brown bars on sides, mostly subtriangular, with apices not or occasionally reaching belly profile and their broad bases confluent on back. One bar shade darker forms ill-defined nuchal collar, tapering on sides and ceasing at horizontal level of pectoral origin, embracing posterior 3 gill slits. Sides and back with very numerous scattered small dark brown spots, somewhat darker on body bars; about 50 on either side between verticals from dorsal origins. Dorsal and lateral surfaces of head in advance of spiracle uniform dark brown. Whole ventral surface of head whitish, except light slate-gray preoral region. Dorsals largely concolorous with body bars, lighter on hind border, each fin with 10 or 12 dark spots. Anal like ventral surface of body, with one large elongated and 3 or 4 small rounded dark spots. Upper half of caudal like body bars, with dark markings like several small longitudinal stripes along upper border, lower half paler, with a number of subcircular dark spots.

Length, 710 mm. (Scott.)

Tasmania. Distinguished from other species by the slightly postmedian insertion of the first dorsal. From *P. variolatum* and *P. ferrugineum* it is distinguished by having the anal inserted wholly before the second dorsal. It differs from *P. collare* in having the nasal cirrus reaching the lip, first gill opening nearer spiracle than pectoral and in the concave hind dorsal edges.

Genus BRACHAELURUS Ogilby

Brachaelurus Ogilby, Proc. Roy. Soc. Queensland, vol. 20, p. 27, 1907; vol. 21, p. 2, 1908. (Type, *Brachaelurus colcloughi* Ogilby, orthotypic.)

Cirriscyllium Ogilby, Proc. Roy. Soc. Queensland, vol. 21, pp. 2, 4, 1908. (Type, *Chiloscyllium modestum* Günther, orthotypic.)

Heteroscyllium Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 455, 1908. (Type, *Brachaelurus colcloughi* Ogilby, virtually. *Heteroscyllium* Regan proposed to replace *Brachaelurus* Ogilby, 1908, considered generically distinct from same name of 1906.)

Body elongate, depressed anteriorly, partly cylindrical posteriorly. Head broad. Snout short, blunt, wide. Eyes small. Mouth moderate, transverse, with labial folds on both jaws, around angles and with symphyseal fold but no fold across chin. Teeth small, tricuspid. Nostrils near snout end, with nasoral grooves and long, slender cirri.

Gill openings small, last widest, last two closer together, 3 above pectoral. Spiracles moderate, behind and partly below eye. Dorsals subequal, first above or behind ventrals, second before anal. Anal small, near subcaudal. Caudal axis slightly raised.

Australia. The first reference to this genus by Ogilby [3] is not only without diagnosis or description, but the resultant genotype, "*Hemiscyllium modestum*" without designated authority, fails for its establishment.

ANALYSIS OF SPECIES

a^1. CIRRISCYLLIUM. Anal base near subcaudal________________________ waddi
a^2. BRACHAELURUS. Anal base nearly twice its length from subcaudal. colcloughi

Subgenus CIRRISCYLLIUM Ogilby

BRACHAELURUS WADDI (Schneider)

Squalus waddi SCHNEIDER, Syst. Ichth. Bloch, p. 130, 1801 (type locality: New Holland [=near Sydney]; Latham).

Scyliorhinus waddii BLAINVILLE, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Brachaelurus waddi WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 182 (note on earliest name), p. 198 (reference), 1934.

Chiloscyllium modestum GÜNTHER, Proc. Zool. Soc. London, 1871, p. 654, pl. 54 (type locality: Queensland).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 299, 1880 (on Günther); vol. 6, p. 363, 1881 (Queensland).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 8, 1888 (Port Jackson, Broken Bay).

Hemiscyllium modestum WAITE, Rec. Australian Mus., vol. 4, p. 28, fig. 9 (mouth), pl. 4, fig. 1 (fetus), 1901 (Port Macquarie and Lillipilli, New South Wales).—OGILBY, Proc. Roy. Soc. Queensland, vol. 20, p. 27, 1907 (reference).

Brachaelurus modestus REGAN, Proc. Zool. Soc. London, p. 354, 1908 (type; Port Jackson).—OGILBY and MCCULLOCH, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 281, 1909 (Woody Point, Moreton Bay; type of *Chiloscyllium furvum* Macleay).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 47, 1913 (New South Wales).—OGILBY, Commerc. Fish. Fisher. Queensland, p. 45, 1915 (Moreton Bay); Mem. Queensland Mus., vol 5, p. 76, 1916 (South Queensland).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 127, 1925 (reference).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1^e note, p. 5, 1926 (Indochina).—MCCULLOCH, Fishes New South Wales, ed. 2, p. 7, pl. 1, fig. 16a, 1927.

Brachaelurus modestum FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference). (Error.)

Cheloscyllium furvum (Maclay) RAMSAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 97, 1880 (type locality: Port Jackson). (Name only; error.)

Chiloscyllium furvum MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 364, 1880 (Port Jackson.)

Chiloscyllium fuscum PARKER and HASWELL, Text-book of zoology, vol. 2, p. 135, 1897 [no locality (Australia)].

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[3] Proc. Roy. Soc. Queensland, vol. 20, p. 27, 1906.

Depth $7\frac{3}{5}$ to $7\frac{3}{4}$ to subcaudal origin; head $4\frac{3}{4}$ to $5\frac{2}{3}$, width 1 to $1\frac{1}{8}$. Snout 2 to $2\frac{3}{5}$ in head, broad and obtuse as seen from above; eye $8\frac{1}{2}$ to $8\frac{2}{3}$, 4 in snout, $3\frac{2}{5}$ to $3\frac{3}{4}$ in interorbital; dentary width $3\frac{3}{5}$ to $3\frac{3}{4}$ in head, with long labial folds around each mouth angle but not meeting at chin; teeth in 18 to 20 rows in jaws, with rather narrow triangular cusp and small cusp each side at base, edges all entire; nostrils greatly nearer mouth than snout tip; front nasal valve with elongate cirrus twice eye length; hind nasal valve with fold on outer side of nostril and continued in fold on outer edge of nasoral groove with end free at mouth angle; interorbital $2\frac{4}{5}$ to $3\frac{1}{10}$ in head, depressed. Gill openings small, last deepest, fourth close to last, third to fifth above pectoral base. Spiracle $\frac{3}{4}$ eye, behind and close below eye.

Scales simple, broadly triangular, each with median keel.

First dorsal origin above middle of ventral base, close behind ventral bases in young, length $1\frac{2}{5}$ in head; second dorsal origin midway between first dorsal origin and anal origin, length 1 to $1\frac{2}{5}$ in head; anal placed entirely behind second dorsal, length $2\frac{1}{8}$ to $2\frac{2}{3}$ in subcaudal or $1\frac{1}{2}$ to 2 in head; subcaudal equals head to fourth gill opening in young, larger in adults; least depth of caudal peduncle 4 in head; pectoral 1 to $1\frac{1}{3}$, width $1\frac{1}{3}$ to $1\frac{1}{2}$ its length; ventral length 1 to $1\frac{2}{3}$ in head.

Largely dark brown, little paler below. About 11 obscure and slightly darker transverse bands, much wider than pale interspaces.

Queensland, New South Wales. Specimen in the Queensland Museum from Woody Point, Moreton Bay.

U.S.N.M. No. 40025. Port Jackson. Australian Museum. Length, 653 mm. As *Chiloscyllium ocellatum*.

U.S.N.M. No. 40036. Port Jackson. Australian Museum. Length, 191 mm.

Subgenus BRACHAELURUS Ogilby

BRACHAELURUS COLCLOUGHI Ogilby

Brachaelurus colcloughi OGILBY, Proc. Roy. Soc. Queensland, vol. 21, p. 4, 1908 (type locality: Mud Island, Moreton Bay).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference).

Brachaelurus (Heteroscyllium) colcloughi GARMAN, Mem. Mus. Comp. Zool., 36, p. 48, 1913 (Queensland, Moreton Bay).

Heteroscyllium colcloughi REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 455, 1908 (note).—OGILBY and MCCULLOCH, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 284, 1909 (type; Queensland).—OGILBY, Mem. Queensland Mus., vol. 5, p. 76, 1916 (Moreton Bay).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 127, 1925 (reference).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Depth $7\frac{3}{5}$ in total length; head $5\frac{3}{5}$, width $1\frac{1}{2}$. Eye $6\frac{2}{5}$ in head; preoral length 3; mouth width $2\frac{7}{10}$; front nasal angle equidistant from mouth and snout tip, internarial equals preoral length, nasal cirrus 1⅗ in preoral length, not reaching lower labial groove; interorbital 2¾ in head, mesially concave. First gill opening 1½ in eye, 1⅗ in last gill opening. Spiracle subvertical, in deep, ovate, rimmed pit, 1½ in eye.

First dorsal inserted above middle of ventral base, front and outer edges sublinear and intervening angle broadly rounded, hind angle pointed, fin base ½ more than vertical fin height; second dorsal similar but smaller; anal height 2⅘ its base, 1⅘ in space to subcaudal; caudal 4⅓ in total body length, subcaudal depth 6⅕ in caudal; pectoral obovate, 1⅘ in head; ventral origin little nearer first dorsal than pectoral.

Upper surfaces, sides and tail ashy gray. Lower surface of head, throat, and abdomen white. Length, 457 mm. (Ogilby and McCulloch.)

Queensland. The type, No. 1965 in the Queensland Museum, from Moreton Bay.

Genus HEMISCYLLIUM Andrew Smith

Hemiscyllium Andrew Smith, Proc. Zool. Soc. London, 1837, p. 86. (Type, *Squalus ocellatus* Bonnaterre, monotypic.)

Chiloscyllium Müller and Henle, Arch. Naturg., 1837, p. 395. (Atypic. Type, *Scyllium plagiosum* Bennett, Syst. Beschr. Plagiostomen, p. 17, 1841: designated by Gill, Ann. Lyceum Nat. Hist. New York, vol. 7, p. 42, 1862.)

Synchismus Gill, Ann. Lyceum Nat. Hist., New York, vol. 7, pp. 407, 408, 1862. (Type, *Squalus tuberculatus* Schneider, orthotypic.)

Body elongate, moderate, shorter than tail. Head moderate or short. Snout short, obtuse. Eyes small, lower lid without fold. Mouth transverse, with labial folds around angles and with or without continuous fold across chin below symphysis. Teeth small, compressed, median cusp triangular with or without smaller lateral cusps at base, 3 or more series in function. Nostrils inferior, near snout end, with nasoral grooves; front nasal valves reach mouth, widely separated by median preoral attachment, each valve with long pointed cirrus; hind valves forming fold at outer side of nostril, continued in fold on outer edge of nasoral groove with short, free extremity. Gill openings narrow, last two wider and close together, last three above pectoral. Spiracle small, below eye, posteriorly very distinct, without or with ridge on hind edge. Fins medium to small. Dorsals two, first behind front of ventral. Anal far behind second dorsal, close to caudal. Anal and subcaudal narrow.

Indo-Pacific. Fossils known from Miocene deposits. The egg capsules are black and oval and are attached to seaweeds by two fibrous extensions along dorsal edge and at some distance from ends.

ANALYSIS OF SPECIES

a^1. HEMISCYLLIUM. Mouth nearer snout end than front eye edge; lower labial fold not crossing or forming fold across chin.
  b^1. Large ocellate dark spot above pectoral.
    c^1. First dorsal origin above ends of ventral bases; spots black, round, scattered ---------- **ocellatum**
    c^2. First dorsal origin behind vertical from ventral bases; spots brown, clustered ---------- **trispeculare**
  b^2. Nonocellated black spot above pectoral; dorsal angles extended behind; spots dark, numerous, rounded ---------- **freycineti**
a^2. Mouth nearer front eye edge than snout end; fold of lower lip continuous.
    d^1. CHILOSCYLLIUM. One median dermal ridge on back; anal shorter than subcaudal.
      e^1. First dorsal origin over forward half of ventral base; dorsals larger than ventrals, hind angles extended ---------- **punctatum**
      e^2. First dorsal origin over middle of ventral base; dorsals smaller than ventrals, hind angles not extended; body with transverse bands and white spots ---------- **plagiosum**
      e^3. First dorsal origin above ventral ends; dorsals smaller than ventrals, hind angles rounded; body with transverse bands and dark spots. **griseum**
    d^2. SYNCHISMUS. Three dermal median ridges on back; fins small, anal long as subcaudal; first dorsal origin above ventral ends, hind angles not extended ---------- **colax**

Subgenus HEMISCYLLIUM A. Smith

HEMISCYLLIUM OCELLATUM (Bonnaterre)

Squalus ocellatus BONNATERRE, Tableau Encyclop. Ichth., p. 8, 1788 (type locality: La mer du Sud) (on *L'Oeillé* Broussonet, Mém. Acad. Sci. Paris, p. 660, no. 10, 1780, New Holland).—SHAW, Nat. Misc., vol. 5, pl. 161, 1783.—GMELIN, Syst. Nat Linn., vol. 1, p. 1494, 1789.—WALBAUM, Artedi Pisc., vol. 3, p. 516, 1792 (copied).—SCHNEIDER, Syst. Ichth. Bloch, p. 129, 1801 (Pacific Ocean at New Holland).—GRIFFITH, Animal Kingd. Cuvier, vol. 10, p. 598, pl. 3, 1834.—ANDREW SMITH, Proc. Zool. Soc. London, 1837, p. 86 (reference).

Scyliorhinus ocellatus BLAINVILLE, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Hemiscyllium ocellatum MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 16, 1841 (New Holland).—VAILLANT, Bull. Soc. Philom. Paris, ser. 8, vol. 3, p. 10, 1891 (Thursday Island).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 44, 1913 (Australia, New South Wales).—FOWLER, Mem. Bishop Mus., vol. 10, p. 17, 1928 (New Guinea, Port Moresby, Port Jackson); Proc. 4th (1929) Pacific Sci. Congr. Java, p. 486, 1930 (East Indies); Mem. Bishop Mus., vol. 11, no. 5, p. 314, 1931 (Port Jackson specimen likely from Queensland).—WHITLEY, Rec. Australian Mus., vol. 18, p. 321, pl. 36, figs. 1a-1d, 1932 (Low Isles, North Queensland).—FOWLER, Mem. Bishop Mus., vol. 11, No. 6, p. 385, 1934 (Port Moresby, New Guinea).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 197, 1934 (reference).

Chiloscyllium ocellatum GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 410, 1870 (Cape York, North West Australia, Sunday Island, Australia, South Sea); in Brenchley's Cruise of *Curaçoa*, p. 409, 1873 (Solomon Islands).—KLUNZINGER, Sitzungsber. Akad. Wiss. Wien, math-nat. Cl., vol. 80, pt. 1,

p. 427, 1880 (Port Darwin).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 363, 1881 (Cape York, Port Darwin, Torres Strait); vol. 7, p. 597, 1883 (New Guinea).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 597, 1883 (reference).—MEYER, Anal. Soc. Españ., Hist. Nat., Madrid, vol. 14, p. 48, 1885 (Kordo, Mysore).—OGILBY, Proc. Linn. Soc. New South Wales, vol. 10, p. 464, 1885 (Port Jackson); Cat. Fishes Australian Mus., pt. 1, p. 8, 1888 (Port Jackson, South East New Guinea, Port Moresby).—STEINDACHNER, Abh. Senck. Ges., vol. 25, p. 463, 1900 (Ternate).—REGAN, Proc. Zool. Soc. London, 1908, p. 359 (Cape York, Sunday Island, Solomons, North West Australia).—OGILBY and MCCULLOCH, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 290, 1909 (Murray Island, Torres Strait, off Cooktown, Masthead Island, off Port Curtis, Port Jackson ?).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 488, 1910 (Solomons).—OGILBY, Mem. Queensland Mus., vol. 5, p. 76, 1916 (Dunk Island and Green Island, Cairns).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—WHITLEY, Australian Zool., vol. 4, pt. 4, p. 228, 1926 (Northwest Islet, Queensland); vol. 16, no. 1, p. 4, 1927 (Michaelmas Cay, Queensland).

Scyllium ocellatum BLYTH, Journ. Asiatic Soc. Bengal, vol. 16, p. 726, pl. 25, fig. 2, 1847 (Australia).

Squalus oculatus GRAY, Narr. Surv. Coasts Australia, King, Pisces, vol. 2 ("1827"), append., p. 436, April 18, 1926 (type locality: Australia). (On Banks and Solander.)

Hemiscyllium oculatum DUMÉRIL, Rev. Mag. Zool., ser. 2, vol. 5, p. 119, 1853 (collection Banks); Hist. Nat. Elasmobr., vol. 1, p. 326, 1865 (type of Broussonet; specimen from Banks).

Depth 11¾ to 12½ to subcaudal origin; head 8 to 8⅕, width 1⅕ to 1¼. Snout 2 in head, broadly obtuse with swollen appearance as viewed above; eye 6, 3⅕ to 3½ in snout, 2⅕ to 2½ in interorbital; dentary width 2¾ to 4 in head, with short labial folds marked by deep grooves around mouth angles but not meeting on symphyseal surface of lower jaw; teeth in 38 rows above 30 rows below, small, tricuspid; nostrils much nearer mouth than snout tip; front nasal valves reaching mouth, conic thick cirrus scarcely long as valve or 1¼ in eye, internarial space about equals eye; hind nasal valve with fold outside nostril and ends in fold on outer edge of groove reaching mouth angle; lower lip not free across symphysis; interorbital 2⅓ to 2¾ in head, depressed. Last gill opening longest, close behind fourth, third to fifth above pectoral base. Spiracle ⅘ of eye, close below and about half its length posterior to eye.

Scales triangular, each with median keel.

First dorsal begins well behind ventrals, length 1⅕ to 1⅖ in head, hind lobe rather narrowly triangular; second dorsal begins nearer anal origin than first dorsal origin, length 1⅕ to 1¼ in head; anal 1⅖ to 1⅗ in subcaudal lobe, height 3½ to 4¼ its length; subcaudal equals head to second gill opening, height 6 in its length; least depth of caudal peduncle 3 to 3½ in head to first gill opening; pectoral width 1⅔ to 1⅘ its length, which equals head or head to second gill opening; ventral 1 in head; claspers long, reach back far as ends of ventrals, each lobe with 2 curved compressed attenuated plates, each of outer with curved denticle-like point.

Back brown, under surface brownish white. Back, sides, and fins with irregular large blackish brown irregular spots, mostly rounded. Above depressed pectoral large black rounded blotch, with narrow whitish or grayish edge. Paired fins brownish above, whitish or pale below. Occasionally several dark or pale blotches on ventrals below.

India, East Indies, Northwest Australia, Northern Territory, Queensland, New South Wales, Melanesia. Specimen in the Queensland Museum from North West Islet.

U.S.N.M. No. 40018. Port Moresby, New Guinea. Australian Museum. Length, 400 mm.

U.S.N.M. No. 40024. Port Moresby. Australian Museum. Length, 735 mm.

U.S.N.M. No. 40025. "Port Jackson" (doubtless erroneous for Port Moresby). Australian Museum. Length, 595 mm.

HEMISCYLLIUM TRISPECULARE Richardson

Hemiscyllium trispeculare RICHARDSON, Icones piscium, p. 5, pl. 1, fig. 2, 1843 (type locality: Turtle Island, Gulf of Carpentaria); Voy. *Erebus* and *Terror*, Fishes, p. 43, pl. 28, figs. 3–7, 1846 (Northwest coast of Australia).—DUMÉRIL, Rev. Mag. Zool., ser. 2, vol. 5, p. 120, 1853 (compiled).—BLEEKER, Versl. Konig, Akad. Wet. Amsterdam, vol. 16, p. 362, 1864 (Grand Key, Moluccas).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 326, 1865 (compiled).—GÜNTHER, Ann. Mag. Nat. Hist., ser. 3, vol. 20, p. 67, 1867 (Turtle Island, Cape York).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 45, 1913 (Northwest Australia).—WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference).—WHITLEY, Rec. Australian Mus., vol. 18, p. 321, pl. 36, figs. 2a–2e, 1932 (Port Darwin).

Chiloscyllium trispeculare GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 411, 1870 (type).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 363, 1881 (compiled).—REGAN, Proc. Zool. Soc. London, 1908, p. 359 (type).—OGILBY and MCCULLOCH, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 293, 1909 (Port Darwin).—OGILBY, Mem. Queensland Mus., vol. 5, p. 77, 1916 (reference).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—PARADICE and WHITLEY, Mem. Queensland Mus., vol. 9, p. 96, 1927 (Knight Reef, Clarence Straits, North Australia).

Depth 7⅘ to subcaudal origin; head 7¼, width 1⅕. Snout 2 in head; eye 5, 2¼ in snout; dental width 4, labial folds on both jaws around angles; teeth small, trilobate; nostrils small, with nasoral groove, front valves reaching mouth, with cirri and hind valves with fold on outer side of nostril continued in fold on outer side of groove with short free end at mouth angle; interorbital low. Last gill opening largest, fourth and fifth closer, third to fifth above pectoral base. Spiracle small, below hind eye edge.

Scales small, partly triangular, with median keel.

First dorsal inserted behind ventral base, front edge equals head length; front edge of second dorsal similar; anal length 1⅛; pectoral reaches 1½ to ventral, width 1⅗ its length which equals head; ventral 1⅛; caudal 4½ in rest of body, subcaudal deep as anal and notch at last fourth its length.

Brown, with numerous small spots and dots of darker, more or less grouped or clustered. Eleven slightly darker underlaid broad ill-defined crossbands, pale interspaces subequal. One to 3 or 4 large black spots, white-edged, above and behind pectoral base. Belly and under surfaces of fins uniformly pale. Length, 570 mm. (Richardson; Garman.)

East Indies, Northwest Australia, North Australia, Queensland.

HEMISCYLLIUM FREYCINETI (Quay and Gaimard)

Scyllium freycineti (Cuvier) QUOY and GAIMARD, Voy. *Uranie*, Zool., p. 192, 1824 (type locality: Waigiu).—MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 20, 1841 (compiled).

Chiloscyllium freycineti RICHARDSON, Rep. 12th (1842) Meet. Brit. Assoc. Adv. Sci., p. 30, 1843 (Australia).—REGAN, Proc. Zool. Soc. London, 1908, p. 359 (compiled).—BEAUFORT, Bijdr. Dierk., Amsterdam, vol. 19, p. 96, 1913 (Saonek, Waigiu).

Hemiscyllium freycineti GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 46, 1913 (Waigiu, Papua).—FOWLER, Mem. Bishop Mus., vol. 10, p. 17, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 197, 1934 (reference).

Scyllium melaisianum LESSON, Voy. *Coquille*, Zool., vol. 2, pt. 1, p. 94, pl. 6, 1830 (type locality: Offack Bay, Waigiu).

Scyllium malaisianum GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 411, 1870 (note).

Chiloscyllium malaianum DUMÉRIL, Rev. Mag. Zool., ser. 2, vol. 5, p. 125, 1853 (types); Hist. Nat. Elasmobr., vol. 1, p. 332, 1865 (types).

Hemiscyllium malayanum BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 7, p. (362) 376, 1854 (Batjan); vol. 8, p. 393, 1855 (Amboina).

Hemiscyllium malaisianum BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 13, p. 386, 1857 (Batjan).

Chiloscyllium plagiosum (not Bennett) BLEEKER, Verh. Batav. Genootsch., vol. 24, p. 17, 1852 (part).

Depth 8⅔ to subcaudal origin; head 8¼. Snout 1⅞ in head; eye 6, 3 in snout; mouth near snout end, with labial folds around angles; front nasal valves with fleshy pointed cirri; interorbital convex, well elevated. Gill openings with last 2 closer and above pectoral base. Spiracle below hind part of eye.

First dorsal origin close behind basal ends of ventrals, front edge equals head to second gill opening; front edge of second dorsal similar; anal length 1⅕ in head; pectoral 1¼ to ventral, width 1¾ its length, which equals head to second gill opening; ventral very slightly less than head; caudal 5¾ in rest of body, subcaudal 1½ in caudal length.

Reddish above, darker on back. Body and fins with numerous round, irregular dark brown spots. Each dorsal with pair of larger dark spots on front edges, spot above inner pectoral axil, 3 or 4 on caudal. Back with 6 or 7 dark obscure saddles. Length, 908 mm. (Lesson.)

East Indies.

Subgenus CHILOSCYLLIUM Müller and Henle

HEMISCYLLIUM PUNCTATUM (Müller and Henle)

Chiloscyllium punctatum MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 19, pl. 3, 1841 (type locality: Java).—GRAY, List Fishes British Mus., p. 35, 1851 (copied).—BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 2, p. 473, 1851 (Rio); Verh. Batav. Genootsch., vol. 24, p. 22, 1852 (Batavia).—DUMÉRIL, Rev. Mag. Zool., ser. 2, vol. 5, p. 123, 1853 (type; Pondicherry Bay; China Sea).—BLEEKER, Act. Soc. Sci. Indo-Néerland., vol. 1, No. 3, p. 8, 1856 (Macassar); Nat. Tijdschr. Nederland. Indië, vol. 20, pp. 238, 447, 1859–60 (Singapore); vol. 22, p. 65, 1860 (Benculen); Act. Soc. Sci. Indo-Néerland. (Sumatra), vol. 8, p. 2, 1860 (Benculen).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 330, 1865 (Sea of Indies, China).—KNER, Reise *Novara*, Fische, p. 413, 1865 (Java).—BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).—KLUNZINGER, Sitzungsber. Akad. Wiss. Wien, math.-nat. Cl., vol. 80, pt. 1, p. 427, 1880 (Port Darwin).—OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 4, p. 181, 1889 (on Klunzinger); Proc. Roy. Soc. Queensland, vol. 20, p. 27, 1907 (egg case from Woody Point).—REGAN, Proc. Zool. Soc. London, 1908, p. 360 (Thursday Island, Singapore, Java).—OGILBY and MCCULLOCH, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 287, fig. 1 (on p. 289 egg case), pl. 43, fig. 2 (fetus), 1909 (Moreton Bay, Dunk Island).—SMITH, Proc. U. S. Nat. Mus., vol. 45, p. 567, 1913 (Siasi market; Zamboanga; Cebu).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 61, 1913 (Singapore, Philippines, South Celebes).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 576, 1913 (Lombok; Saleyer).—OGILBY, Mem. Queensland Mus., vol. 5, p. 77, 1916 (note).—HERRE, Philippine Journ. Sci., vol. 26, p. 118, 1925 (San Miguel Bay, Camarines Sur; Calapan).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—WHITLEY, Australian Zoologist, vol. 4, pt. 4, p. 227, 1926 (Northwest Islet, Capricorn Group, and off Flat Top Island, Mackay, Queensland).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 592, 1930 (Shanghai); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (reference).—WHITLEY, Rec. Australian Mus., vol. 18, p. 322, figs. 1a–f, 1932 (Northwest Islet).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete).—GILTAY, Mem. Mus. Roy. Nat. Hist. Belg., Hors. ser. 5, vol. 3, p. 9, 1933 (Weeim Island, north of Misol).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 197, 1934 (reference).—HERRE, Fishes Herre Philippine Exped. 1931, p. 10, 1934 (Cebu; Dumaguete).—SUVATTI, Index Fish. Siam, p. 1, 1937 (Sriracha).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 11, 1937 (reference).

Scyllium punctatum VAN HASSELT, Algemein Konst. Letterbode, May 1823, p.— (Java).

Hemiscyllium punctatum FOWLER, List Fish. Malaya, p. 7, 1938 (reference).

Scyliorhinus russellianus Blainville, Bull. Soc. Philom., Paris, 1816, p. 121 (name only; assumed based on *Bokee sorrah* Russell, Fishes of Coromandel, vol. 1, p. 10, pl. 16, 1803; type locality: Vizagapatam; *Ra sorrah* Russell, Fishes of Coromandel, vol. 1, p. 10, 1803, Vizagapatam).

Chiloscyllium indicum (not Gmelin) Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 17, 1852 (part).—Günther, Cat. Fishes British Mus., vol. 8, p. 412, 1870 (part).—Day, Fishes of India, pt. 4, p. 726, 1878 (part).—Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 317, fig. 1, 1902 (Formosa).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol 26, p. 604, fig. 2, 1903 (Formosa example).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 698, 1908 (Japan).

Chiloscyllium margaritiferum Bleeker, Nederland. Tijdschr. Dierk., vol. 1, p. (240) 243, 1864 (type locality: Obi Island).

Chiloscyllium griseum (part) Müller and Henle, Syst. Beschr. Plagiostomen, pl. 4, 1841.

Depth 8¼ to subcaudal origin; head 6, width 1¼. Snout 2 in head, obtusely pointed as seen above; eye 7, 3¾ in snout, 2⅔ in interorbital, twice long as deep; dentary width 3⅔ in head, with short labial folds at each mouth angle and broad lower lip free across symphysis; teeth in 30 rows above, 28 below, small cusps rather broadly triangular, edges entire; nostrils near first fourth in snout, cirri little less than orbit; interorbital 3⅛ in head, broadly and slightly convex. Gill openings narrow, third and fourth widest, fifth close under fourth and third to fifth above pectoral base. Spiracle 1⅔ in eye, opposite hind eye edge and close below.

Scales very small, crowns flattened, each with 5 to 9 keels. Single slight median keel down back.

First dorsal begins opposite first third of ventral base, length 1⅕ in head, hind lobe short point; second dorsal origin little nearer anal origin than first dorsal origin, length 1⅕ in head, hind lobe short point; anal height ⅓ its length, which 1⅘ in head, 1⅘ in subcaudal, 2¼ in caudal; least depth of caudal peduncle 3¾ in head; subcaudal height 5⅓ its length, height uniform, length equals head to second gill opening; pectoral width 1⅗ its length, which 1⅐ in head; ventral 1⅖; claspers 1⅓ in ventral, edges smooth.

Uniform light brown above, paler below.

East Indies, Philippines, China, Northern Territory of Australia, Queensland. Example in the Queensland Museum from Moreton Bay.

U.S.N.M. No. 32700. Batavia, Java. Royal Museum of Leiden. Length, 750 mm.

HEMISCYLLIUM PLAGIOSUM (Bennett)

Scyllium plagiosum Bennett, Life of Raffles, p. 694, 1830 (type locality: Sumatra).—Andrew Smith, Proc. Zool. Soc. London, 1837, p. 85 (reference).

Chiloscyllium plagiosum Müller and Henle, Syst. Beschr. Plagiostomen, p. 17, 1841 (Indian Ocean, Japan, "Brazil").—Richardson, Ichth. China Japan, p. 194, 1846 (China Sea, Canton).—Cantor, Journ. Asiatic Soc. Bengal, vol.

18, p. 1374, 1849 (Pinang, Malay Peninsula, Singapore).—Jerdon, Madras Journ. Lit. Sci., vol. 17, p. 148, 1851.—Gray, List fish British Museum, p. 34, 1851 (China; Cape Seas).—Bleeker, Verh. Batavia Genootsch., vol. 24, p. 17, 1852 (part); vol. 25, pp. 9, 80, 1853 (Bengal), (on Russell).—Duméril, Rev. Mag. Zool., Ser. 2, vol. 3, p. 122, 1853.—Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 7, p. 228, 1854 (Macassar); vol. 12, p. 218, 1856 (Nias); Act. Soc. Sci. Ind-Néerland., vol. 3, No. 9, p. 6, 1858 (Siboga, Sumatra); Nat. Tijds. Nederland. Indië, vol. 21, p. 57, 1860 (Cape of Good Hope); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 328, 1865 (Sea of Indies).—Day, Fishes of Malabar, p. 267, 1865.—Regan, Proc. Zool. Soc. London, 1908, p. 362, pl. 12, fig. 1 (Formosa, Singapore, Manado, Amoy, Manila, China).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 62, 1913 (Hongkong, Siam, Singapore, Pinang).—Herre, Philippine Journ. Sci., vol. 26, p. 120, 1925 (Manila Bay; Calapan, Mindoro).—Fowler, Hong Kong Nat., vol. 1, p. 33, fig. 6, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (Formosa; Japan).—Suvatti, Index Fish. Siam, p. 1, 1937 (Gulf of Siam; Sriracha; Canthaburi).—Roxas and Martin, Dept. Agri. Comm. Manila Tech. Bull. 6, p. 11, 1937 (reference).

Chiloscyllium indicum var. *plagiosa* Günther, Cat. Fishes British Mus., vol. 8, p. 412 1870 (China, Amoy, Japan, Formosa).

Chiloscyllium indicum var, *plagiosum* Ogilby, Cat Fishes Australian Mus., pt. 1, p. 8, 1888 (Singapore).

Hemiscyllium plagiosum Fowler, List Fish. Malaya, p. 7, 1938 (reference).

Chiloscyllium indicum var. *margaritifera* (not Bleeker) Günther, Cat. Fishes British Mus., vol. 8, p. 412, 1870 (China: Japan).

Chiloscyllium indicum var. *obscura* (part) Günther, Cat. Fishes British Mus., vol. 8, p. 413, 1870 (Cape Seas, India, Ceylon, China).

Chiloscyllium caeruleopunctatum Pellegrin, Bull. Soc. Zool. France, vol. 39, p. 230, 1914 (type locality: Fort Dauphin, Madagascar).

Depth 9¼ to subcaudal origin; head 6¼, width 1½. Snout 2½ in head; eye 7, 2⅘ in snout, 3 in interorbital; mouth very broad, transversly straight, mandible with broad undivided flap, its hind edge undulated; teeth numerous, pointed, rather small, with basal cusp each side; nostrils large, with nasoral groove, each with cirrus; interorbital 2½ in head, slightly elevated, flattened. Gill openings subequal except last two which are very close, last 3 above pectoral base.

Scales rather large, coarse. Back with low median keel.

First dorsal origin over last fourth in ventral base, front edge 1⅛ in head; front edge of second dorsal 1⅖; anal length 1⅖; pectoral reaches 1⅔ to ventral, width 1¼ its length which equals head; ventral length 1⅙, clasper robust; caudal 4⅖ in rest of body, subcaudal little deeper than anal and notch at last fourth in caudal length.

Pale brown above, whitish beneath. Above 13 broad deep brown crossbars, between which on median line of back deep brown spot. Sides of body with many light spots, some invade dark crossbars, more or less regular in size, also some on sides of abdomen enlarged. Length, 642 mm. (Jordan and Fowler.)

Cape Colony, Madagascar, India, Ceylon, Malay Peninsula, Pinang, Singapore, East Indies, Siam, Philippines, China, Formosa, Japan. *Chiloscyllium caeruleopunctatum* based on an example 665 mm., was thought to differ chiefly in its numerous small blue spots. Garman has shown that variation in color is considerable. His largest example was 750 mm.

HEMISCYLLIUM GRISEUM (Müller and Henle)

Chiloscyllium griseum Müller and Henle, Syst. Beschr. Plagiostomen, p. 19, 1841 (type locality: Japan).—Gray, List fish Brit. Mus., p. 35, 1851 ("India, Java").—Duméril, Rev. Mag. Zool., 1853, p. 124 (sea of the Indies).—Regan, Proc. Zool. Soc. London, 1908, p. 360, pl. 11, fig. 1, pl. 13, fig. 3 (young) (Kurrachee, Moluccas, Vizagapatam, Madras, Malabar, Pinang, Malay Peninsula, type of *Chiloscyllium hasseltii* Bleeker).—Pellegrin, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 3, 1912 (Red Sea.)—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 64, 1913 (South Africa, India, Japan).—Raj, Rec. Indian Mus., vol. 10, pp. 318–319, 1914 (egg case).—Southwell and Prashad, Rec. Indian Mus., vol. 16, pp. 215, 240, 1919 (egg case).—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 100, 1928 (Bombay); Mem. Bishop Mus., vol. 10, p. 17, 1928 (note on Thiollière).—Pillay. Journ. Bombay Nat. Hist. Soc., vol. 33, p. 350, 1929 (Travancore).—Fowler, Hong Kong Nat., vol. 1, p. 33, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (Indian Ocean material); Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 89, 1935 (Bangkok); vol. 89, p. 128, 1937 (Rayong); List Fish. Malaya, p. 6, 1938 (reference).

?*Scyliorhinus unicolor* Blainville, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Scyllium griseum Van Hasselt, Bull. Sci. Nat. Férussac, vol. 2, p. 89, 1824 (Java) (name only).

Chiloscyllium plagiosum (not Bennett) Müller and Henle, Syst. Beschr. Plagiostomen, p. 18, 1841 (part).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1374 (part), 1849.—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 17, 1852 (Batavia and Samarang).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 328, 1865 (part).

Chiloscyllium obscurum Gray, List fish British Museum, p. 25, 1851 (type locality: Moluccas) (no description).

Chiloscyllium indicum var. *obscura* Günther, Cat. Fishes British Mus., vol. 8, p. 413, 1870 (Moluccas; type of *Chiloscyllium hasseltii* Bleeker; Vizagapatam).

Chiloscyllium indicum var. *obscurum* Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 8, 1888 (Malabar).

Chiloscyllium hasseltii Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, pp. 14, 19, 1852 (type locality: Batavia); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).

Chiloscyllium punctatum (part) Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 22, 1852 (Batavia).

Chiloscyllium indicum (not Gmelin) Day, Fishes of India, pt. 6, p. 726, pl. 188, fig. 3, 1878 (India, Malay Archipelago); Fauna British India, vol. 1, p. 34, fig. 14, 1889.—Volz, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 238, 1907 (Siboga, Priaman, Padang, Benkulen).

Depth 8¾ to subcaudal origin; head 5¼, width 1¼. Snout 2⅒ in head, as seen from above obtuse; eye 7½ in head, 3 in snout, 2⅗ in interorbital, depth 1¾ its own length; dentary width 2⅖ in head, with short labial folds at each mouth angle and broad lower lip free across symphysis; teeth in 30 to 32 rows in jaws, triangular, edges entire; nostrils midway in snout length, cirri 1⅛ in eye; interorbital 2⅗ in head, depressed. Gill openings narrow, third to fifth widest and above pectoral base, fourth nearly conceals fifth. Spiracle 1⅖ in eye, close below and slightly behind eye edge.

Scales rather narrowly triangular, small, each with single median keel. Single median ridge on back.

First dorsal begins close behind ventral bases, length 1¼ in head, hind lobe slight obtuse angle; second dorsal begins nearer anal origin than first dorsal origin, length 1⅖ in head, hind lobe slight obtuse angle; anal height 4⅓ its length which 1⅕ in head or 1⅗ in subcaudal length; least depth of caudal peduncle 4¾ in head; subcaudal height 5⅖ its length, highest medianly, length equals head; pectoral 1¼, width 1⅓ its length; ventral 1¾ in head, reaches back opposite first third in first dorsal base.

Pale brown. Thirteen transverse dark brown saddles on back, all broader than pale interspaces. Dorsals each with 2 large dark blotches. Several inconspicuous dark blotches on paired fins.

Red Sea, South Africa, India, Malay Peninsula, Pinang, Singapore, East Indies, China, Japan.

1 example (with U.S.N.M. no 40032). China Seas. Australian Museum. Length, 190 mm.

Subgenus Synchismus Gill

HEMISCYLLIUM COLAX (Meuschen)

Squalus colax Meuschen, Index Gronow's Zoophylacium, Pisces, 1781.

Chiloscyllium (Synchismus) colax Whitley, Australian Zool., vol. 9, p. 228, 1939.

Squalus indicus Gmelin, Syst. Nat. Linn., vol. 1, p. 1503, 1789 (type locality: Indian Ocean).—Walbaum, Artedi Pisc., vol. 3, p. 520, 1792 (on Gronow).—Forster, Fauna Indica, p. 13, 1795.—Lacépède, Hist. Nat. Poiss., vol. 1, p. 280, 1796 (on Gmelin).—Schneider, Syst. Ichth. Bloch, p. 137, 1801 (East Indies).

Chiloscyllium indicum Günther, Cat. Fishes British Mus., vol. 8, p. 411, 1870 (Vizagapatam, Pinang, India, types of *Squalus caudatus* Gray and *Chiloscyllium phymatodes* Bleeker).—Martens, Preuss. Exped. Ost-Asien, p. 409, 1876 (Hongkong, Bangkok, Singapore).—Day, Fishes of India, pt. 4, p. 726, pl. 188, fig. 3, 1878.—Günther, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 51, 1880 (Manila).—Károli, Termesz. Füzetek, Budapest, vol. 5, p. 148, 1881 (Singapore).—Meyer, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 48, 1885 (Manado, Celebes).—Ogilby, Cat. Fishes Australian Mus., vol. 1, p. 8, 1888 (Chinese Seas).—Day, Fauna British India, vol. 1, p. 34, fig. 14, 1889.—Elera, Cat. Fauna Filip., vol. 1, p. 617, 1895 (Luzon, Santa Cruz, Cavite).—Bartlett, Sarawak Gazette, vol. 26, no. 366, p. 134, 1896 (Maratabas).—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 38 (Nagasaki),

p. 128 (reference), 1901.—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 604, 1903 (not fig. or Formosan example).—Johnstone, Fasc. Malayenses, Annandale and Robinson, Zool., pt. 2, p. 302, 1903 (Patani Bay).—Düncker, Mitt. Naturh. Mus. Hamburg, vol. 21, p. 192, 1904 (locality ?).—Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang).—Regan, Proc. Zool. Soc. London, 1908, p. 362, pl. 13, fig. 2 (types of *Squalus caudatus* Gray and *Chiloscyllium phymatodes* Bleeker; Cape of Good Hope).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 53 (Padang material).—Günther, Journ. Mus. Godeffroy, pt. 17, p. 488, 1910 (Solomon Islands).—Pellegrin, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 3, 1912 (Red Sea).—Southwell, Ceylon Adminstr. Rep., 1912–13, pp. E44, E49.—Smith, Proc. U. S. Nat. Mus., vol. 45, p. 568, 1913 (Kowloon, China).—Zugmayer, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8 (Mekran), p. 17, 1913.—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 65, 1913 (Pinang; Singapore).—Pearson, Ceylon Administr. Rep., 1915–18, p. F12.—Fowler, Copeia, 1918, No. 58, p. 62 (Philippines).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 38, pl. 2, fig. 4, 1925 (on Regan).—Chabanaud, Service Océanogr. Pêches Indo-Chine, 1^e note, p. 5, 1926 (Indochina).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^e note, p. 66, 1929 (Cochinchina).—Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 4, fig. 2, 1929 (Amoy).—Fowler, Hong Kong Nat., vol. 1, p. 33, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (East Indies, Philippines).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 224, fig. 4, 1932 (Chefoo).—Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 88, 1933 (Wenchow; Yenting).—Suvatti, Index Fish. Siam, p. 1, 1937 (Paknam; Tha-cin; Canthaburi).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 11, 1937 (reference).

Hemiscyllium indicum Fowler, List Fish. Malaya, p. 7, 1938 (reference).

Squalus tuberculatus Schneider, Syst. Ichth. Bloch, p. 137, 1801 (on *Le Squale dentelé* Lacépède, Hist. Nat. Poiss., vol. 1, p. 281, pl. 11, fig. 1, 1798, no locality).

Scyliorhinus tuberculatus, Blainville, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Chiloscyllium tuberculatum Müller and Henle, Syst. Beschr. Plagiostomen, p. 20, 1841 (Cape of Good Hope).—Gray, List fish British Museum, p. 35, 1851 (Cape Seas; China).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 20, 1852 (Samarang).—Duméril, Rev. Mag. Zool., ser. 2, vol. 5, p. 124, 1853 (compiled).—Bleeker, Nat. Tijdschr. Nederland. Indie, vol 10, p. 340, 1856 (Rio, Bintang); vol. 21, p. 57, 1860 (Cape of Good Hope).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 331, 1865 (type of *Le Squale dentelé* Lacépède, without locality).—Kner, Reise *Novara*, Fische, p. 412, 1865 (Madras).

Squalus gronovianus Shaw, General zoology, vol. 5, p. 353, 1804 (type locality: Indian Seas; on *Le Squale gronovien* Lacépède, Hist. Nat. Poiss., vol. 1, p. 280, 1798, Les mers de l'Inde).

?*Scyliorhinus variegatus* Blainville, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Scyliorhinus dentatus Blainville, Bull. Soc. Philom., Paris, 1816, p. 121 (name only, likely on *Le Squale dentelé* Lacépède).

?*Scyliorhinus lambarda* Blainville, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Chiloscyllium phymatodes Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, pp. 14, 21, 1852 (type locality: Samarang); Nat. Tijds. Nederland. Indie, vol. 2, p. 419, 1856 (Muntok, Banka); vol. 20, p. 447, 1859–60 (Singapore).—

Duméril, Hist. Nat. Elasmobr., vol. 1, p. 331, 1865 (compiled).—Kner, Reise *Novara*, Fische, p. 413, 1865 (Ceylon).

Chiloscyllium indicum var. *phymatodes* Günther, Cat. Fish. Brit. Mus., vol. 8, p. 413, 1870 (type; Pinang).

Squalus caudatus Gray, Cat. Fish. Gronow, p. 8, 1854 (type locality: In mari Indico).

Depth 9 to 9¾ to subcaudal origin; head 4⅗ to 7, width 1¼ to 1⅓. Snout 2 to 2⅓ in head, obtusely pointed as seen from above; eye 6 to 7½, 3 to 3⅔ in snout, 3 in interorbital, depth 1⅔ its length; dentary width 3 to 3⅔ in head, with short labial folds at each angle and broad lower lip free across symphysis; teeth in 30 rows in each jaw, cusps rather broadly triangular, edges entire; nostrils slightly before middle in snout length, cirri equal eye; interorbital 2⅗ to 2¾ in head, depressed. Gill openings narrow, last widest, fourth close before fifth and second to fifth above pectoral base. Spiracle 1⅖ in eye, opposite its hind edge and close below.

Scales rather narrowly triangular, small, each with single median keel. Single median ridge on back and less developed one each side above flank.

First dorsal begins behind ventral base, length 1¼ to 1½ in head, hind lobe right angle; second dorsal origin nearer anal origin than ventral origin, length 1⅕ to 1⅞ in head, hind lobe right angle; anal height 5 to 5½ its length which 1½ to 1⅗ in subcaudal lobe or 1⅛ to 1¾ in head; least depth of caudal peduncle 4¼; subcaudal height 5 to 6¼ in its length, little higher posteriorly, length equals head or head to second gill opening; pectoral 1 to 1⅛ in head, width 1⅔ to 1¾ its length; ventral length 1⅖ to 1½ in head, ends reach back opposite first third of first dorsal base or in very young opposite first dorsal origin.

Pale brown generally. Eleven or 12 broad transverse dark brown bands or saddles on head and trunk, wider than pale interspaces and on tail narrower than pale interspaces. Each dark band also with few pale spots besides obscure darker ones. Dorsals dark brown with few whitish spots. Upper surfaces of paired fins pale, with few dark spots. In young small white spots, more contrasted, and along edges of fin.

Red Sea, Arabian Sea, Cape of Good Hope, India, Ceylon, Pinang, Singapore, East Indies, Philippines, Indo China, China, Formosa, Melanesia.

U.S.N.M. No. 12623. No locality. British Museum. Length, 175 mm.

U.S.N.M. No. 40032. China Seas. Australian Museum. Length, 182 to 217 mm. Three examples.

U.S.N.M. No. 75953. "Japan?" (probably China?). P. L. Jouy. Length, 195 to 398 mm. Two examples.

Genus ORECTOLOBUS Bonaparte

Orectolobus Bonaparte, Icon. Fauna Ital., Pesci, vol. 3, fasc. 7, 1834 (description). (Type, *Squalus barbatus* Gmelin, intended by Gill, Proc. U. S. Nat. Mus., vol. 18, p. 211, 1895.)

Chrossorhinus Andrew Smith, Proc. Zool. Soc. London, 1837, p. 86. (Type, *Squalus lobatus* Schneider=*Squalus barbatus* Gmelin, monotypic.)

Crossorhinus Müller and Henle, Sitz. Ber. Askad. Wiss. Berlin, vol. 2, p. 113, 1937; Syst. Beschr. Plagiostomen, p. 21, 1841. (Type, *Squalus barbatus* Gmelin, monotypic.)

Eucrossorhinus Regan, Proc. Zool. Soc. London, 1908, p. 357. (Type, *Crossorhinus dasypogon* Bleeker, monotypic.)

Body stout, depressed, cavity half or more total length. Tail shorter, slender, compressed. Head wide, flattened above. Snout obtuse. Eye small, orbit elongate. Mouth wide, transverse, nearly terminal or partly inferior, labial folds on both jaws and around angles. Teeth compressed, narrow, with or without small lateral denticles. Nostrils near snout end, joined with mouth by nasoral grooves, front nasal valves with cirrus. Gill openings narrow, third to fifth above pectoral, fourth and fifth close together. Spiracle moderate or wide oblique slit below and after eye. Sides of head with many skinny flaps. Chin with or without barbels. First dorsal after ventrals, second before anal. Anal small, close to subcaudal. Tail short. Caudals narrow, other fins short and broad, notch between subcaudal and terminal.

Eastern Pacific, Australia. "The Wobbegongs or Carpet Sharks are ovoviviparous ground sharks of sluggish habits, frequenting the neighbourhood of the shore, where they lie concealed among the weed covered rocks. Their beautiful color patterns, harmonious contrasts of varied browns and lilacs, assimilate their surroundings so perfectly as to deceive the small fishes and crustaceans which with mollusks, form the bulk of their food. The imitation is accentuated by the fringes of dermal lobes which adorn the lips and sides of the head, and which are not found in any other selachian." (Ogilby and McCulloch.)

ANALYSIS OF SPECIES

a^1. Orectolobus. Last 2 gill openings little closer than others.
  b^1. Nasal cirrus with at least short median branch.
    c^1. No supraorbital papilla: chin usually without dermal flaps.
      d^1. Dermal lobes simple -- **ornatus**
      d^2. Dermal lobes bifid or trifid ----------------------------------- **japonicus**
    c^2. One or 2 supraorbital papillae; chin usually with dermal lobes.
      e^1. Side of head with only few wide-spaced dermal lobes ---- **maculatus**
      e^2. Side of head with nearly continuous row of branched dermal lobes. **ogilbyi**
  b^2. Nasal cirrus simple; supraorbital papilla present ----------- **tentaculatus**
a^2. Eucrossorhinus. Gill openings equidistant; nasal cirrus ramose; 16 to 20 dermal flaps along edge of lower lip ------------------------- **dasypogon**

Subgenus Orectolobus Bonaparte

ORECTOLOBUS ORNATUS (De Vis)

Crossorhinus ornatus De Vis, Proc. Linn. Soc. New South Wales, vol. 7, p. 289, 1883 (type locality: Queensland coast).—Macleay, Proc. Linn. Soc. New South Wales, vol. 9, p. 63, 1884 (compiled).

Orectolobus ornatus Regan, Proc. Zool. Soc. London, 1908, p. 356, pl. 11, fig. 2 (young) (Australia).—Ogilby and McCulloch, Proc. Journ. Roy. Soc. New South Wales, vol. 42, p. 276, pl. 42, fig. 1, 1909 (type; Woody Point, Moreton Bay).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 49, 1913 (Queensland).—Fowler. Mem. Bishop Mus., vol. 11, No. 6, p. 385, 1934 (Port Moresby, New Guinea material).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Crossorhinus barbatus (not Gmelin) McCoy, Prodromus Zool. Victoria, dec. 5, pl. 43, fig. 1, 1880 (part). Macleay, Proc. Linn. Soc. New South Wales, vol. 7, p. 597, 1883 (New Guinea).

Orectolobus devisi Ogilby, Mem. Queensland Mus., vol. 5, p. 75, 1916 (type locality: Moreton Bay, p. 181) (on De Vis specimen); Commerc. Fish. Fisher. Queensland, p. 45, 1915 (Moreton Bay; no description).—Waite, Rec. South Australian Mus., vol. 2, p. 16, fig. 16, 1921 (St. Vincent Gulf, South Australia).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 127, 1925 (reference).—McCulloch, Fishes New South Wales, ed. 2, p. 7, pl. 1, fig. 15b, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (compiled).

Head 4 to subcaudal origin, width $1\frac{1}{10}$ in its length. Snout 2⅖ in head; eye 10⅔, 4⅓ in snout, 3⅓ in interorbital; mouth width 1¾ in head, long lower labial folds not crossing mandibular symphysis; nasal cirrus short, simple lobe with shorter outer each side, also 2 above each mouth angle and 2 each side of head; interorbital 2⅞ in head. Gill openings equidistant, last 3 above pectoral base. Spiracle nearly twice eye diameter.

First dorsal origin over last third in depressed ventral length, front edge two in head; front edge of second dorsal 2⅛; anal length 2⅕; pectoral 1⅗, width half its length which 1⅘ to ventral; ventral length 1⅘ in head; caudal 3⅛ in rest of body, notch about last $\frac{2}{7}$.

Grayish, back with obscurely defined dark brown crossbars; one behind head before gill openings; one opposite pectoral base, one before ventrals, one from each dorsal and 2 or 3 on caudal; pectoral bar and predorsal bar with irregular edges, each encloses pair of ocelli; posterior bars nearly meet in mid-ventral line. Fins with large dark spots. Length, 180 mm. (Regan.)

Queensland, New South Wales, Victoria, South Australia. Specimens in the Queensland Museum from Moreton Bay and Woody Point.

ORECTOLOBUS JAPONICUS Regan

Orectolobus japonicus Regan, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 435, 1906 (type locality: Japan and China); Proc. Zool. Soc. London, 1908, p. 356 (type).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 53 (no data).—

Garman, Mem. Mus. Comp. Zool., vol. 36, 50, pl. 56, fig. 3, 1913 (heart) (Japan).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. (Vertebrata) p. 190, 1920 (Tokyo).—Fowler, Hong Kong Nat., vol. 1, p. 32, fig. 5, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (Japan).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher, Inst., vol. 5, p. 5, 1930.—(Far East Seas).—Schmidt, Trans. Pacific Comn. Acad. Sci. U.S.S.R., vol. 11, p. 5, 1931 (Nagasaki).—Tanaka, Jap Fish. Life Colours, No. 12, 1933.

Crossorhinus barbatus (not Gmelin) Müller and Henle, Syst. Beschr. Plagiostomen, p. 21, pl. 5, 1841 (type locality: Japan) (not New Holland references).—Schlegel, Fauna Japonica, Pisces, pt. 15, p. 301, 1850 (Japan, Goto Islands, Nagasaki).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 21, 1853 (Goto and Nagasaki); vol. 26, p. 42, 1857 (Japan).—Günther, Cat. Fish. Brit. Mus., vol. 8, p. 414, 1870 (Japanese material).—Ishikawa and Matsuura, Prelim. Cat. Fish. Mus. Tokyo, p. 61, 1897.—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 38 (128), 1901 (Goto Islands).—Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, no. 4, p. 5, fig. 3, 1929 (Amoy).

Orectolobus barbatus Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 606, 1903 (Hakata and Nagasaki).

Crossorhinus lobatus (not Schneider) Müller and Henle, Syst. Beschr. Plagiostomen, pl., 1841 (Japan).

Squalus labiatus Bleeker, Verh. Batav. Genootsch. (Japan), vol. 26, p. 42, 1847 (name in synonymy).

Depth 7⅘ to subcaudal origin; head 4½, width 1⅕. Snout 2⅗ in head, broadly depressed, rounded as seen in profile as seen from above; eye 10¼ in head, without tubercle on upper lid, 3¾ in snout, 3½ in interorbital; dentary width 2⅕ in head, with long deep groove around each mouth angle though not meeting at symphysis; teeth in 18 rows above, 16 below, each tooth with long narrow median cusp and short cusp each side basally, edges of all entire; nostrils close below end of snout, joined with mouth by short deep nasoral groove; front nasal valves reach teeth, each broadly lobate, separated by narrower preoral lobe, cirrus twice long as valve or eye with short lobe midway on outer edge; hind nasal valve forms lobe on outer side of nostril and partly continuous with upper lateral fold and fold along outer border of nostril; interorbital 3, depressed. Gill openings above pectoral, fourth close before fifth which largest. Spiracle large, oblique, equals 1¾ eye diameters, begins opposite hind part of eye.

Scales minute, triangular, with one to several keels or points. Above upper lip 2 flattened dermal flaps; behind fold of mouth angle series of 4 or 5 flattened dermal flaps; on side of pharynx 2 short flattened dermal lobes.

First dorsal begins opposite middle of ventral base, length 1⅔ in head, hind lobe triangular; second dorsal origin nearer anal origin than first dorsal origin, length 1⅔ in head; anal 2⅖, 1⅘ in lower caudal lobe; sub-caudal height 4⅗ in its length, length 1⅕ in head;

least depth of caudal peduncle 6¼; pectoral 1⅕, width 1⅖ its length; ventral length 1½ in head.

Body light brown above, more whitish below. Ten dark brown saddlelike bands across back, all variegated with irregular pale spots or blotches same shade as general body color; intervening pale areas clouded or irregularly marked with dark areas, blotches, spots or cloudings. Dorsals dark brown, with paler diffusions. Paired fins dark brown above, with some pale spots basally and marginally. Under surfaces of paired fins with brownish shades.

China, Japan. The characters of this species were first made known by Regan, and he showed that it differs from the Australian *Orectolobus maculatus* in the absence of papilliform projections above the eye; nasal cirrus with simple branch; 2 or 3 simple dermal lobes above upper lip followed by 3 or 4 near mouth angle, first and last of which bifid and by 2 short, broad, terminally notched ones at side of head.

U.S.N.M. No. 22608. Awa, Japan. Japanese Government. Length, 540 mm.
U.S.N.M. No. 50725. Hakata Jordan and Snyder.
U.S.N.M. No. 75952. "Japan." P. L. Jouy.

ORECTOLOBUS MACULATUS (Bonnaterre)

Squalus maculatus BONNATERRE, Tabl. Encyclop. Ichth., p. 8, 1788 (type locality: La mer du Sud).—ANDREW SMITH, Proc. Zool. Soc. London, 1837, p. 85 (reference).

Scyliorhinus maculatus BLAINVILLE, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Scyllium maculatum CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1373, 1849 (Singapore).

Orectolobus maculatus OGILBY and MCCULLOCH, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 273, pl. 42, fig. 2, 1909 (Woody Point, Moreton Bay, Queensland).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 52, 1913 (Australian Seas).—OGILBY, Commerc. Fish. Fisher. Queensland, p. 45, 1915 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 75, 1916 (Moreton Bay).—WAITE, Rec. South Australian Mus., vol. 2, no. 1, p. 15, fig. 15, 1921.—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 127, 1925 (reference).—MCCULLOCH, Fishes New South Wales, ed. 2, p. 7, pl. 1, fig. 15a, 1927.—FOWLER, Mem. Bishop Mus., vol. 10, p. 17, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (reference).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Squalus barbatus GMELIN, Syst. Nat. Linn., vol. 1, p. 1493, 1789 (type locality: New Holland=Sydney) (on *Barbu* Broussonet, Mem. Acad. Sci. Paris, 1780, p. 657, no. 7; New Holland).—WALBAUM, Artedi Pisc., vol. 3, p. 515, 1792 (copied).—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 246, 1798 (Sydney, New South Wales).—SCHNEIDER, Syst. Ichth. Bloch, p. 128, 1801 (New Holland).—BENNETT, Gatherings Nat. Australasia, p. 32, 1860 (Botany Bay).

Scyliorhinus barbatus BLAINVILLE, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Crossorhinus barbatus Duméril, Rev. Mag. Zool., ser. 2, vol. 5, p. 125, 1853 (Australia); Hist. Nat. Elasmobr., vol. 1, p. 338, 1865 (Australia; not Japan and China).—Schmeltz, Cat. Mus. Godeffroy, no. 4, p. 28, 1869 (South Sea).—Günther, Cat. Fishes British Mus., vol. 8, p. 414, 1870 (South Australia, New Holland, Tasmania; not Japan).—McCoy, Prodromus Zool. Victoria, dec. 5, pl. 43, fig. 1, 1880.—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 97, 1880 (Port Jackson).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 365, 1881 (Port Jackson, Tasmania, South Australia).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 9, 1888 (Port Jackson, Richmond River, Port Stephens).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 44, 1890 (reference).—Waite, Prelim. Rep. *Thetis* Exped., p. 39, 1898 (off Newcastle, New South Wales, in 21 to 48 fathoms).

Orectolobus barbatus Waite, Mem. Australian Mus., vol. 4, p. 32, 1899 (off Newcastle).—Regan, Proc. Zool. Soc. London, 1908, p. 355 (New South Wales, Sydney, Tasmania, South Australia).—Stead, Fishes of Australia, p. 232, 1908.

Chiloscyllium barbatus Macleay, Proc. Linn. Soc. New South Wales, vol. 7, p. 597, 1883 (reference).

Squalus lobatus Schneider, Syst. Ichth. Bloch, p. 137, 1801 (type locality: New Holland) (on *Watt's Shark* Phillip, Voy. Gov. Phillip to Botany Bay, p. 285, pl. 53, 1789; Sydney Cove, Port Jackson).—Andrew Smith, Proc. Zool. Soc. London, 1837, p. 86 (reference).

Chrossorhinus lobatus Andrew Smith, Proc. Zool. Soc. London, 1837, p. 86 (reference).

Squalus appendiculatus Shaw, Nat. Misc., vol. 17, pl. 727, 1806 (type locality: Antarctic Seas) (on *Watt's Shark* Phillip).

Depth 9½ to 10 to subcaudal origin; head 4⅗ to 5, width 1 to 1⅛. Snout 2½ to 2⅘ in head, widely depressed, rounded in profile as seen from above; eye 9 to 10 in head, with 2 tubercles along upper eyelid, 3⅖ to 4¾ in snout, 3⅘ to 4⅘ in interorbital; dentary width 2 to 2½ in head, deep groove around each mouth angle though not meeting at symphysis; teeth in 19 or 20 rows above, 16 or 17 rows below, each tooth with long narrow median cusp and sometimes short basal cusp each side, edges of all entire; nostrils close below ends of snout, joined with mouth by short deep nasoral groove; front nasal valves reach teeth, each broadly lobate, separated by narrower preoral lobe, cirrus twice long as valve or equals 1⅔ eye diameters, with short bifid lobe midway on outer edge; hind nasal valve forms fold on outer side of nostril extending to upper labial fold and a longitudinal fold along side of nasoral groove, free pointed end of which directed toward mouth angle; interorbital 2⅗ in head, depressed. Gill openings above pectoral, fourth much longest and close before fifth. Spiracle large, oblique, equals 1¾ eye diameters, begins opposite hind part of eye.

Scales minute, triangular, with one or several points and keels. Above upper lip 3 to 5 flattened dermal flaps; behind fold of mouth angle series of 4 or 5 flattened dermal flaps and 2 more on side of pharynx.

First dorsal begins opposite middle to hind end of ventral base, length 1⅗ to 1⅔ in head, hind lobe right angle; second dorsal origin nearer anal origin than first dorsal origin, length 1⅘ to 1⅞ in head; anal 1⅘ to 2, 1½ to 1⅘ in subcaudal; subcaudal height 4½ its length, subcaudal length 1⅛ to 1¼ in head; least depth of caudal peduncle 5 to 6½; pectoral 1⅕ to 1¼, width 1⅕ to 1⅖ its length; ventral length 1⅓ to 1½ in head; claspers of larger example little developed.

Upper surfaces brown, below paler to whitish. Upper surface variously spotted or marked with pale rings, arcs, bars or blotches. Ten obscure underlaid dark saddles, usually on back and tail. Dorsals and caudal largely like back, also paired fins above all with some pale spots.

Queensland, New South Wales, Victoria, Tasmania, South Australia, Western Australia. Specimen in the Queensland Museum from Woody Point, Moreton Bay.

U.S.N.M. No. 29012. Port Jackson. Australian Museum.
U.S.N.M. No. 39999. Port Jackson. Australian Museum. Length, 655 mm.
U.S.N.M. No. 40004. Port Jackson. Australian Museum. Length, 570 mm.

ORECTOLOBUS OGILBYI Regan

Orectolobus ogilbyi REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 3, p. 529, 1909 (type locality: Torres Strait).—OGILBY, Mem. Queensland Mus., vol. 5, p. 75, 1916 (Dunk Island).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 127, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (compiled).—WHITLEY, Mem. Queensland Mus., vol. 10, p. 198, 1934 (reference).

? *Crossorhinus barbatus* (not Gmelin) MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 597, 1883 (New Guinea).

Crossorhinus dasypogon (not Bleeker) OGILBY, Cat. Fish. Australian Mus., vol. 1, p. 9, 1888 (Torres Strait).

Orectolobus dasypogon OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 4, p. 184, 1889 (Torres Strait).—KENT, Great Barrier Reef, p. 307, 1893 (Thursday Island).—OGILBY, Ann. Queensland Mus., no. 9, p. 4, 1908 (Dunk Island, Queensland).—OGILBY and MCCULLOCH, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 272, pl. 43, fig. 1, 1909 (Samarai, New Guinea; Torres Strait).

Depth 7⅞ to subcaudal origin; head 4¾. Snout 3 in head, broadly rounded, flattened above; eye 7½, 2¾ in snout, upper eyelid with 2 papillae; 6 more or less branched dermal lobes on upper lip, outermost longest; behind mouth angle to first gill opening row of 14 or more branched lobes in 3 groups of which first longest; chin with row of similar lobes, median longest; nasal cirrus with 2 or 3 simple or bifurcated lobes on their outer margins, space between their bases equal to ⅓ mouth width or ½ interorbital. Gill openings graduated back to fourth smaller, fifth larger, first and second more widely spaced than others.

Scales minute, rough, smoother on tail and hinder portion of body.

First dorsal origin over last fifth of ventral base, front fin edge 1⅞ in head; front edge of second dorsal 2; anal begins behind second dorsal base, front fin edge 2⅖ in head; pectoral 1, width 1¾ its length, which reaches 1⅖ to ventral; ventral length 1¼ in head; caudal 4⅗ in rest of body, notch at last sixth its length.

Light sandy, covered with network of dark brown rings, small on head and larger on sides and tail. Each ring with more or less distinct darker center, which plainest on tail. Large dark brown blotches break uniformity of network at regular intervals. About 5 inconspicuous darker cross bands on body and 4 more distinct ones on tail. Fins like body, except network finer on hind borders. Length, 1,210 mm. (Ogilby and McCulloch.)

New Guinea, Queensland.

ORECTOLOBUS TENTACULATUS (Peters)

Crossorhinus tentaculatus Peters, Monatsb. Akad. Wiss. Berlin, 1864, p. 123 (type locality: Adelaide, South Australia).—Günther, Ann. Mag. Nat. Hist., ser. 3, vol. 20, p. 67, 1867 (Adelaide; Cape York).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 365, 1881 (Cape York).—Kent, Great Barrier Reef, p. 48, fig. 5, 1893.

Orectolobus tentaculatus Regan, Proc. Zool. Soc. London, 1908, p. 357, pl. 12, fig. 2 (Cape York).—Ogilby and McCulloch, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 278, 1909 (Port Adelaide).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 51, 1913 (Queensland).—Ogilby, Mem. Queensland Mus., vol. 5, p. 76, 1916 (Queensland; note); vol. 6, p. 97, 1918 (Port Darwin).—Waite, Rec. South Australian Mus., vol. 2, no. 1, p. 16, fig. 17, 1921.—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 127, 1925 (reference).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (reference).—Whitley, Mem. Queensland Mus., vol. 10, p. 194, 1934 (reference).

Head 4 to subcaudal origin, width 1⅛ its length. Snout 2 in head; eye 12, 4 in snout, 5⅓ in interorbital, papilla above posterior part of eye; on each side small, simple, dermal lobe above upper lip, larger one at mouth angle and third at side of head; nasal cirrus long, simple. Last 2 gill openings close together, others equidistant.

First dorsal inserted little before hind basal ventral edge, front fin edge 1⅞ in head; front fin edge of second dorsal 2½; anal length 1⅔; pectoral 1½, width 1½ its length which 1$\frac{3}{10}$ to ventral; ventral length 2 in head; caudal 4¼ in rest of body, notch little behind last fourth in length.

Yellowish, back grayish. On back before first dorsal fin 3 large dark areas edged with white, continuous or subcontinuous with dark vertical bars on sides. Tail completely circled by 3 dark vertical bands, correspond to 2 dorsal and anal fins. Fins with large dark spots. Length, 430 mm. (Regan.)

Queensland, South Australia. The type was 900 mm. long.

Subgenus EUCROSSORHINUS Regan

ORECTOLOBUS DASYPOGON (Bleeker)

Crossorhinus dasypogon BLEEKER, Arch. Néerland. Sci. Nat., vol. 2, p. 400, pl. 21, fig. 1, 1867 (type locality: Off Waigiu; Aru); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 298 (Waigiu), p. 306 (Aru), 1868.

Eucrossorhinus dasypogon REGAN, Proc. Zool. Soc. London, 1908, p. 357 (type, from Waigiu).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 53, 1913 (compiled).—FOWLER, Mem. Bishop Mus., vol. 10, p. 17, 1928 (compiled).

Orectolobus dasypogon FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (reference).

Depth about 7¼ to subcaudal origin; head 3⅔, little broader than long. Snout 2⅔ in head; eye 9 to 14, 3 in snout, 4 to 6 in interorbital; mouth width 1⅓ to 1½ in head; teeth in 16 to 20 rows; nostrils terminal on snout, front valve with long lateral cirrus on fold with several lobules; hind valves form fold around outer nasal edge, continue backward into upper lip fold and another along side of nasoral groove, end in cirroid free extremity toward mouth angle. Gill openings equidistant, above pectoral base. Spiracle twice eye diameter.

Scales lanceolate. Between narial lobe and mouth angle 5 branched lobes, between mouth angle and pectoral base 20 and 16 to 20 along edge of lower lip.

First dorsal origin above last fourth of ventral base, front edge 2⅕ in head; front edge of second dorsal 1⅞; anal inserted behind second dorsal base, length about 2⅔ in head; pectoral length 1⅛, about wide as long; ventral 1½ in head; caudal 3 in rest of body, notched at last fifth.

Brown, variegated with small variable, close-set white spots. Caudal with 4 or 5 transverse darker obscure bands. Lower surfaces uniformly pale or plain colored. Length, 800 mm. (Bleeker; Garman.)

East Indies.

Genus STEGOSTOMA Müller and Henle

Stegostoma MÜLLER and HENLE, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 112. (Type, *Squalus fasciatus* Hermann, Arch. Naturg., 1837, pt. 1, p. 395; orthotypic.)

Body slender, less than half total. Tail long, slender, compressed. Head short, wide. Snout short, thick, obtuse. Eyes small, lids without folds. Mouth transverse, upper lip thin between nasal valves and teeth, short labial folds around mouth angles. Teeth small, tricuspid, in transverse pads of about 28 rows in each. Nostrils with nasoral grooves; front valves united in broad thick pad in front of preoral fold on outer side of groove ending in short flaps at mouth angle. Gill openings small, fourth and fifth close together, last 3 above pectoral base. Spiracles small, behind eyes. Nasal valves, preoral fold and chin covered with modified scales. Dorsals approximated, small, first larger and above ventrals, second smaller than and advanced from anal. Anal near caudal. Caudal large, horizontal, narrow subcaudal without lobe.

Indian Ocean and Western Pacific.

STEGOSTOMA FASCIATUM (Hermann)

Figure 7

Squalus fasciatus Hermann, Tab. Affin., p. 302, 1783 (on *Squalus varius* Seba, Thesauri, vol. 3, p. 105, pl. 34, fig. 1, 1758, no type locality given).—Bloch, Naturg. ausländ. Fische, vol. 1, p. 19, pl. 113, 1785 (Tranquebar).—Walbaum, Artedi Pisc., vol. 3, p. 515, 1792 (on Bloch).—Shaw and Nodder, Nat. Misc. vol. 11, pl. 434, 1800 (Indian Seas).—Andrew Smith, Proc. Zool. Soc. London, 1837, p. 85 (reference).

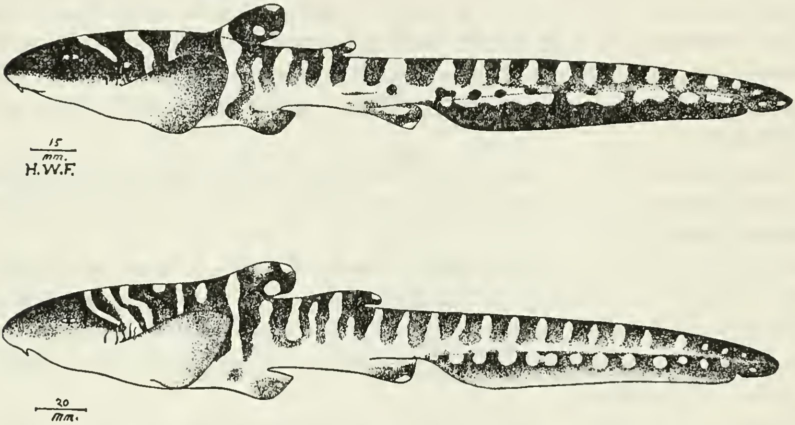
15 mm.
H.W.F.
20 mm.

Figure 7.—*Stegostoma fasciatum* (Hermann): Variation of color pattern in young.

Scyliorhinus fasciatus Blainville, Bull. Soc. Philom., Paris, 1816, p. 121 (name only.)

Stegostoma fasciatum Müller and Henle, Syst. Beschr. Plagiostomen, p. 24, pl. 7, 1841 (Indian Ocean; Red Sea).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1378, 1849 (Pinang).—Jerdon, Madras Journ. Lit. Sci., vol. 17, p. 148, 1851.—Gray, List fish British Museum, p. 38, 1851 (Indian Ocean, Madras, India).—Bleeker, Verh. Batav, Genootsch. (Plagiost.), vol. 24, p. 23, 1852 (Samarang); (Bengal) vol. 25, p. 9, 1853 (on *Pollee makum* Russell, Fishes of Coromandel, vol. 1, p. 11, pl. 18, 1830, Vizagapatam).—Duméril, Rev. Mag. Zool., ser. 2, vol. 5, p. 128, 1853 (sea of the Indies; Red Sea).—Bleeker, Nat. Tijds. Nederland. Indië, vol. 22, p. 101, 1860 (Singapore).—Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 35, 1860 (Sandheads, Calcutta).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 336, 1865 (Sea of the Indies; coasts of Madagascar).—Günther, Fishes of Zanzibar, p. 140, 1866 (Aden; Zanzibar).—Peters, Montasb. Akad. Wiss. Berlin, 1868, p. 281 (Malacca).

Stegostoma fasciatus Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 672, 1871 (Koseir, Red Sea).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 511, 1891 (reference).

Stegostoma (*Scyllium*) *fasciatum* GUICHENOT, Mém. Soc. Sci. Cherbourg, ser. 2, vol. 2, p. 148, 1866 (Madagascar).

Squalus tygrinus BONNATERRE, Tableau Encyclop. Ichth., p. 8, pl. 8, fig. 23, 1788 (type locality: La mer des Indes).

Squalus tigrinus PENNANT, Indian zoology, p. 24, 1769 (Indian Ocean) (inadmissible; name only).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1493, 1789 (Indian Ocean).—FORSTER, Fauna Indica, p. 24, pl. 13, fig. 2, 1795.—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 248, 1798.

Scyliorhinus tigrinus BLAINVILLE, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Stegostoma tigrinum GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 409, 1870 (India, Zanzibar, Ceylon, Formosa).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 115, 1874 (Chinese drawing).—DAY, Fishes of India, pt. 4, p. 725, pl. 187, fig. 4, 1878 (Red Sea, East Africa, India, Malay Archipelago).—GORGOZA, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 74, 1885 (Paragua).—BRUSINA, Glasnik Naravosl. Družtva, vol. 3, p. 227, 1888 (Red Sea).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 7, 1888 (Cape York; Madras; Formosa); Proc. Linn. Soc. New South Wales, ser. 2, vol. 4, p. 181, 1889 (Cape York).—DAY, Fauna British India, vol. 1, p. 33, fig. 13, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 511, 1891 (reference).—ELERA, Cat. Fauna Filip., vol. 1, p. 616, 1895 (Paragua, Puerta Princesa).—BARTLETT, Sarawak Gazette, vol. 26, no. 366, p. 134, 1896 (Buntal and Moratabas).—WAITE, Rec. Australian Mus., vol. 3, p. 133, 1899 (Hawkesbury River, New South Wales; Cape York specimen).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 238, 1907 (Priaman and Langkat, Sumatra).—REGAN, Proc. Zool. Soc. London, 1908, p. 363 (Zanzibar, Formosa, Sarawak, North West Australia, India, Ceylon).—OGILBY, Ann. Queensland Mus., no. 9, p. 4, 1908 (Cape York and Normanton).—TANAKA, Fishes of Japan, vol. 4, p. 65, pl. 16, figs. 55–58, 1911 (Tokyo market).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E41, E49.—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 489, 1912 (Naha, Okinawa).—ZUGMAYER, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—OGILBY, Mem. Queensland Mus., vol. 5, p. 77, 1916 (Cape Bowling Green, Dunk Island, Cape York, Normanton).—FOWLER, Copeia, no. 58, p. 62, 1918 (Philippines); Proc. Acad. Nat. Sci. Philadelphia, 1927, p. 255 (Philippines); Journ. Bombay Nat. Hist. Soc., vol. 33, p. 100, 1928 (Bombay; Philippine example).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p 350, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e^ note, p. 65, 1929 (Cochinchina).—FOWLER, Hong Kong Nat., vol. 1, p. 31, fig. 4, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 486, 1930 (Philippine Islands; Indian Ocean).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 89, fig. 1, 1933 (Yenting).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 182 (Wyndham, Western Australia; Moreton Bay; Botany Bay), p. 198 (reference), 1934.—BARNARD, Ann. South African Mus., vol. 32, pt. 2, p. 45, 1937 (Algoa Bay; St. Francis Bay; Durban).—SUVATTI, Index Fish. Siam, p. 1, 1937 (Ko Sichang, Gulf of Siam).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 12, 1937 (reference).

Stegostoma tygrinum OGILBY and MCCULLOCH, Journ. Proc. Roy. Soc. New South Wales, vol. 42, p. 295, 1909 (Little Mulgrave River, Port Jackson district, Cape Work, Normanton; Doboo, Aroo Islands; Dunk Island).—OGILBY, Mem. Queensland Mus., vol. 3, p. 131, 1915 (Cape Bowling Green, egg case); vol. 5, p. 77, 1916 (Cape Bowling Green, Dunk Island, Little Mulgrave River);

vol. 6, p. 97, 1918 (Southport, Queensland).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 127, 1925 (reference).—McCulloch, Fishes New South Wales, ed. 2, p. 7, pl. 2, fig. 18a, 1927.—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 362, 1935 (Natal); List Fish. Malaya, p. 8, 1938 (reference).

Squalus longicaudus Gmelin, Syst. Nat. Linn., vol. 1, p. 1496, 1789 (no locality) (on Gronow and Seba).

Squalus maculatus (not Bonnaterre, 1788) Schneider, Syst. Ichth. Bloch, p. 130, 1801 (type locality: "Habitat in ocean orientali").

Scyllium quinquecarinatum Van Hasselt, Algemein Konst. Letterbode, May 1823, p. — (type locality: Java).

Scyllium heptagonum Rüppell, Neue Wirbelth., Fische, p. 61, pl. 17, fig. 1, 1835 (type locality: Djedda, Red Sea).

Stegostoma carinatum Blyth, Journ. Asiatic Soc. Bengal, vol. 16, pt. 2, p. 725, pl. 25, fig. 1, 1847 (type locality: India).

Squalus pantherinus (Kuhl and Van Hasselt) Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 23, 1852 (name in synonymy).

Squalus cirrosus Gray, Cat. Fish. Gronow, p. 46, 1854 (no locality).

Stegostoma varium Garman, Mem. Mus. Comp. Zool., vol. 36, p. 59, 1913 (type locality: East Africa).—Herre, Philippine Journ. Sci., vol. 26, p. 125, 1925 (Manila Bay; San Jose del Monte).—Chevey, Inst. Océanogr. Indochine, 19^e note, p. 5, 1932 (Cochinchina).—Herre, Journ. Pan-Pac. Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete).—Tortonese, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 43, p. 222, 1933 (mar Rosso); ser. 3, vol. 45, p. 8, 1935–36 (Bahia di Assab, mar Rosso).

Stegastoma varium Herre, Fishes Herre Philippine Exped. 1931, p. 10, 1934 (Dumaguete) (error).

Depth 4⅓ to 4½ to subcaudal origin; head 3⅖ to 4, width 1 to 1⅕. Snout 1⅔ to 1¾ in head; eye 10 to 10½, 7 in snout, 9 to 9¾ in interorbital; mouth width 2½ to 3⅖, with short labial folds at angles and with preoral upper fold followed by hind narial flap; teeth small, tricuspid, 20 to 23 rows in each jaw; interorbital 1⅛ to 1⅓ in head, broadly convex. Spiracle short vertical slit about half eye diameter behind eye and length 1½ in eye.

Scales with median keel and 1 or 2 laterals each side, all ending in short points.

First dorsal inserted little before ventral, length 1¼ to 1½ in head; second dorsal before anal, length 1⅔ to 2⅗ in head; anal length 2⅒; ventral 1⅘ to 2; pectoral 1⅛ to greater than head or reaches ⅜ to caudal base, width 1¼ its length; caudal very slightly less than rest of body to little greater in young.

Brown largely, under surface of head and abdomen uniform whitish. Over back 12 cross bands of little deeper brown, each bordered broadly by blackish, between snout end and first dorsal with first 8 looped variably as pairs; on rest of body and tail about 25 dark cross bands of which half dozen looped and paired. Whole lower side of body and tail, also anal and upper surfaces of paired fins, with dark or blackish spots, largest but little longer than eye.

Red Sea, Arabia, Zanzibar, East Africa, Madagascar, India, Ceylon, Pinang, East Indies, Indo China, Philippines, China, Formosa, Riu Kiu, Japan, North West Australia, Queensland, New South Wales. Specimens in the Queensland Museum from Little Mulgrave River, Queensland. Also egg case of an example 3,535 mm. from Stradbroke Island and egg case with young from the Aru Islands, H. Macready, I. 2085.

1 example. A.N.S.P. Philippines. Commercial Museum Philadelphia. Length, 356 mm.

1 example. A.N.S.P. Bombay, India. Dr. F. Hallberg. Length, 788 mm.

24149. Makassar, Celebes. December 22, 1909. Length, 274 mm.

13975. Makassar, Celebes. December 26, 1909. Length, 313 mm.

U.S.N.M. No. 49325. Massaua, Red Sea. Bellotti Collection. Length, 282 mm. With 28 transverse yellowish bars.

Family ISURIDAE

Body fusiform. Caudal peduncle depressed, with lateral keel each side. Head subconic. Eye without nictitating folds. Mouth inferior, large, crescentic, with labial folds. Teeth moderate, pointed. Nostrils oblique, near mouth but not confluent with it. Gill opening wide, before pectoral. Spiracle small. First dorsal large. Second dorsal and anal small. Caudal much less than half total length, vertebral axis and fin much elevated backward from horizontal. Caudal with pits. Pectorals falciform.

ANALYSIS OF GENERA

a^1. Teeth with entire edges, awllike, with or without basal denticles.
  b^1. Teeth without basal denticles at all ages______________________ Isurus
  b^2. Teeth with one or more basal denticles each side, at least with age_ Lamna
a^2. Teeth with serrated edges, without basal denticles____________ Carcharodon

Genus ISURUS Rafinesque

Isurus Rafinesque, Caratteri animali piante Sicilia, p. 11, 1810. (Type, *Isurus oxyrinchus* Rafinesque, monotypic.)

Oxyrhina Agassiz, Poissons Fossiles, vol. 3, pp. 87, 276, 1836. (Type, *Lamna oxyrhina* Valenciennes, monotypic.)

Plectrostoma Gistel, Naturg. Thierreichs, p. x, 1848. (Type, *Oxyrhina mantelli* Agassiz, orthotypic.) (Fossil.)

Isuropsis Gill, Ann. Lyceum Nat. Hist. New York, vol. 7, pp. 398, 408, 1862. (Type, *Oxyrhina glauca* Müller and Henle, orthotypic.)

Anatodus Le Hon, Prélim. Mém. Poiss. Tert. Belge, p. 8, 1871. (Type, *Anatodus agassizii* Le Hon, monotypic.) (Fossil.)

Body mackerellike or tunnylike, with slender caudal peduncle. Snout pointed, rather long. Teeth awllike, long, lanceolate, cutting edges sharp and entire, without basal cusps, base with 2 roots. Gill opening wide, before pectoral. Spiracle behind eye or absent. First dorsal large, entirely behind pectoral or nearly midway between latter and ventrals. Second dorsal and anal very small. Caudal crescentic, with well-produced lower lobe. Pectoral large, partly falciform.

Many fossils, mostly as teeth, known from the Cretaceous and later.

ANALYSIS OF SPECIES

a^1. Teeth in 24 rows above, 22 below; lateral line inconspicuous.
  b^1. First dorsal height 3½ or more in predorsal.
    c^1. Anal base wholly behind second dorsal ____________ **bideni**
    c^2. Anal base partly beneath second dorsal ____________ **glaucus**
  b^2. First dorsal height less than 3½ in predorsal ____________ **mako**
a^2. Teeth in 44 rows above, 56 below; conspicuous ridge as lateral line from behind eye, over gill openings then to caudal carina ____________ **guntheri**

ISURUS BIDENI Phillipps

Isurus bideni Phillipps, New Zealand Journ. Sci. Techn., vol. 13, p. 227, fig. 2, 1932 (type locality: South Africa) (based on jaws and photograph).

Differs from the New Zealand species in the relative heights of the dorsal fins and the depth of the caudal peduncle. Body more rounded, first dorsal shorter, and caudal less deeply concave. Teeth similar.

ISURUS GLAUCUS (Müller and Henle)

Oxyrhina glauca Müller and Henle, Syst. Beschr. Plagiostomen, p. 69, pl. 29, 1841 (type locality: Java).—Schlegel, *in* Siebold's Fauna Japonica. Poiss., pt. 15, p. 302, 1850 (Japan).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 21, 1853 (Japan); vol. 26, p. 42, 1854 (Japan).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 409, 1865 (Mer du Japon et non les côtes de Java).

Lamna glauca Günther, Cat. Fishes British Mus., vol. 8, p. 391, 1870 (Cape Seas; St. Helena).—Hector, Colonial Mus. Governm. Surv. Dept. (Fishes of New Zealand), p. 77, 1872.—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 356, 1881 (New South Wales coast).—Ogilby, Cat. Fishes, Australian Mus., vol. 1, p. 5, 1888 (Port Jackson and Botany Bay).—Boulenger, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—Stead, Fishes of Australia, p. 233, 1908.—Günther, Journ. Mus. Godeffroy, pt. 17, p. 484, 1910 (St. Helena, Cape of Good Hope, Muscat).—Zugmayer, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).

Isuropsis glaucus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 40, 1901 (Nagasaki).

Isuropsis glauca Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 127, 1901 (reference).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 623, 1903 (Nagasaki; Matsushima).—Jordan and Evermann, Bull. U. S. Fish Comm., vol. 23, 1903, pt. 1, p. 43, fig. 5, 1905 (Honolulu).—Pietschmann, Sitz, Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 675, 1908 (Japan).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 189, 1920 (Tokyo).

Isuropsis glaucca Jordan and Thompson, Mem. Carnegie Mus., vol. 6, p. 207, 1914 (Tokyo market). (Error).

Isurus glaucus OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1771, 1888 (Port Jackson).—GARMAN, Mem. Mus. Comp. Zool., vol. 35, p. 38, 1913 (Idzu Sea, Japan).—OGILBY, Mem. Queensland Mus., vol. 5, p. 74, 1916 (Bulwer, Moreton Bay).—WAITE, Rec. South Australian Mus., vol. 2, No. 1, p. 21, fig. 27, 1921.—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 102, pl. 2, 1925 (Zanada Museum).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 8, fig. 22, 1927.—FOWLER, Mem. Bishop Mus., vol. 10, p. 18, 1928 (Honolulu).—WHITLEY, Pap. Proc. Roy. Soc. Tasmania, 1928, p. 45, 1929 (Tasmania).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 589, 1930 (Tokyo markets); Proc. 4th (1929) Pacific Sci. Congress, Java, p. 488, 1930 (Japan; Hawaii).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 6, 1931 (Kagoshima).—CHEVEY, Inst. Océanogr. Indochine, 19^e note, p. 5, 1932 (Indo China).—TANAKA, Jap. Fish. Life Colours, No. 20, 1933.

Isurus glauca BARNARD, Ann. South African Mus., vol. 21, p. 33, pl. 1, fig. 6, 1925 (from Waite) (Cape Seas).

Oxynotus gomphodon (not Müller and Henle) CROSS, Proc. Roy. Soc. Van Diemen's Land, vol. 3, pt. 1, p. 81, 1855 (Tasmania).

Lamna (Oxyrrhina) spallanzanii (not Rafinesque) KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 669, 1871 (Red Sea).

Lamna spallanzanii DAY, Fishes of India, pt. 4, p. 722, pl. 186, fig. 2, 1878 (Red Sea, Indian Ocean); Fauna British India, vol. 1, p. 26, fig. 7, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 592, 1913 (Lomblem).—ZUGMAYER, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran and Oman).

Lamna spallanzani TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e note, p. 64, 1929 (Phuroc-hai).

Oxyrhina spallanzanii BRUSINA, Glasnik Narovosl. Družtva, vol. 3, p. 226, 1888 (Red Sea).

Lamna huidobrii PHILIPPI, Anal. Univ. Chile, vol. 71, p. 548, pl. 3, fig. 1, 1887 (type locality: Santiago).—QUIJADA, Boll. Mus. Chile, vol. 5, pt. 1, p. 111, 1913 (Chile).

Depth 6⅓ to subcaudal origin; head 4¼, rather narrowly attenuated in profile. Snout 2¾ in head; eye 12¼, 5¼ in snout; mouth long as wide, sides straight to broadly arched anterior portion; labial folds nearly half jaw length, at inner edge of lips; teeth long, slender, unequal, sharp-edged, outlines sinuate, 24 rows above, 22 below; nostrils small, width ⅖ orbit, nearer eye than snout tip; interorbital broadly convex. Gill openings long as snout, last before pectoral base. Spiracle minute, above mouth angle.

First dorsal origin opposite inner pectoral angle, front fin edge 1⅗ in head; second dorsal length 4⅗; anal length 7; pectoral 1$\frac{1}{10}$, width 2$\frac{1}{10}$ its length; ventral 2¼ in head; clasper rather slender; upper caudal lobe equals head, subcaudal 1½ upper; carina on caudal peduncle 1⅓ in head.

Back dark bluish or blackish brown, contrasted sharply by caudal carina from white of under surfaces. (Day; Garman.)

Red Sea, Arabia, Cape of Good Hope, India, East Indies, Indo China, Japan, Queensland, New South Wales, Tasmania, New Zealand, Hawaii. Also Chile and the Atlantic at St. Helena. According to Barnard reaches 2,100 mm.

ISURUS MAKO Whitley

Isurus mako WHITLEY, Rec. Australian Mus., vol. 17, p. 101, 1929 (on Phillipps).—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 13, p. 227, 1932 (note).

Isuropsis mako WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 194 (Port Jackson; New South Wales; Noonta Bay, South Australia), p. 199 (reference), 1934.

Isurus glaucus (not Müller and Henle) PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 6, p. 268, fig. 13, 1924 (off Auckland; Manukau bar); Trans. New Zealand Inst., vol. 56, p. 530, pl. 87, 1926 (New Zealand).

Differs from *Isurus glaucus* and *Isurus bideni* in the height of the first dorsal fin less than 3½ in the predorsal length.

Australia and New Zealand.

ISURUS GUNTHERI (Murray)

Lamna guntheri MURRAY, Ann. Mag. Nat. Hist., ser. 5, vol. 13, p. 348, 1884 (type locality: Kurrachee, India).—DAY, Fishes of India, Suppl., p. 810, 1888 (copied).

Isurus güntheri GARMAN, Mem. Mus. Comp. Zool., vol 36, p. 39, 1913 (copied).

Snout much produced, partly triangular. Mouth angle midway between nostril and first gill opening. "Teeth $^{22}/_{28}$" (on p. 351 as "$^{22}/_{28}$ on each side"), edges sharp, smooth, no basal cusp. Nostrils conspicuous, open, nearer eye than snout tip. Gill openings subequal.

Skin smooth. From before eye to snout tip each side, band of irregularly arranged minute pores; similar patch on cheeks and below snout. Strongly ridged lateral line continued before caudal carina along entire body over gill openings ending immediately behind eye.

First dorsal nearer pectoral than ventral, about its own length behind hinder pectoral base; anal its own length behind second dorsal; caudal with pit, upper lobe falcate, carina begins opposite anal origin; pectoral narrowing falcately from base to tip.

Dark plumbeous on upper half, grayish on lower half. Underside of snout yellowish. Length, 2,220 mm. (J. A. Murray.)

India. This nominal species is only known from the above description. It differs, however, from all the other species of the genus in its very conspicuous lateral line, short caudal keel, and the teeth. It would seem that Murray intends to give 44 teeth in the upper jaw and 56 in the lower, though this is not absolutely certain.

Genus LAMNA Cuvier

Lamna Cuvier, Règne Animal, vol. 2, p. 126, 1817. (Type, *Lamna cornubica* Cuvier= *Squalus cornubicus* Gmelin, designated by Gill, Ann. Lyceum Nat. Hist. New York, vol. 8, p. 32, 1861.)

Lamia (not Edwards, 1771, or Fabricius, 1775) Risso, Hist. Nat. Europe Mèrid., Poissons, vol. 3, p. 123, 1826. (Type, *Squalus cornubicus* Gmelin, monotypic.)

Sclanonius Fleming, British Animals, p. 169, 1828. (Type, *Squalus selonus* (Walker) Leach, monotypic.)

Exolcs Gistel, Naturg. Thierreichs, p. ix, 1848. (Type *Squalus nasus* Bonnaterre, virtually. *Exoles* Gistel proposed to replace *Lamna* Cuvier.)

Body short, stout, back elevated. Snout pointed, prominent. Teeth triangular, pointed, entire, each with small basal cusp each side, sometimes obsolete in young. Gill openings wide. First dorsal and pectoral somewhat falcate, former behind pectoral base. Second dorsal and anal very small, nearly opposite.

This genus differs from *Isurus* in the presence of the small basal cusp each side of the large median cusp. "The appearance of the Porbeagle is even more repulsive than that of the other Sharks. It emits an extremely disagreeable, fetid smell, and the surface of the body, which is yielding and at several spots flabby, acquires a dirty look from the secretion of tough mucus. This is especially copious at all the orifices, and it was this uncleanness, which is shared by the whole phalanx, that suggested the ancient name of *Squalus*." (Smitt.)

LAMNA NASUS (Bonnaterre)

Squalus nasus Bonnaterre, Tableau Encyclop. Ichth., p. 10, pl. 85, fig. 350, 1788 (no locality) (on *Le Nez* Broussonet).

Isurus nasus Garman, Mem. Mus. Zool., vol. 36, p. 34, 1913 (British Islands, Mediterranean, Western Atlantic, Japan).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 488, 1930 (Atlantic Ocean).—Tanaka, Jap. Fish. Life Colours, No. 19, 1933.—Fowler, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 32, fig. 5, 1936 (Italy).

Lamna nasus Waite, Rec. Canterbury Mus., vol. 1, p. 6, 1907 (reference).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 102, 1925 (off Ize).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Squalus glaucus (not Linnaeus) Gunner, Norsk. Vidensk. Selsk. Skr. Trondhjem, vol. 4, pt. 1, 1768.

Squalus cornubicus Gmelin, Syst. Nat. Linn., vol. 1, p. 1497, 1789 (type locality: Cornwall, England).

Squalus cornubica Cuvier, Règne Animal, vol. 2, p. 127, 1817 (reference).

Lamna cornubica Agassiz, Poissons fossiles, vol. 3, p. 287, pl. G, figs. 3a-d, 1836.—Müller and Henle, Syst. Beschr. Plagiostomen, p. 67, 1841 (Atlantic Ocean, Mediterranean, Japan).—Schlegel, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 304, 1850 (Japan).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 21, 1853 (Japan).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 405, 1865 (France, Algeria).—Günther, Cat. Fishes British Mus., vol. 8, p. 398, 1870 (Eastbourne, Plymouth, England).—Day, British Fishes, vol. 2, p. 297, pl. 156, 1880–1884.—Jordan and Snyder, Annot. Zool. Japon., vol.

3, p. 40 (127), 1901 (reference).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 623, 1903 (compiled).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 55 (Italian example).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 11, 1930 (Far East Seas).

Isurus cornubicus BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 26, p. 42, 1857 (Japan).

Squalus pennanti WALBAUM, Artedi Pisc., vol. 3, p. 517, 1792 (on Pennant, Arctic Zoology, vol. 3, p. 118, pl. 17, 1792, type locality: Atlantic Ocean).

Squalus monensis SHAW, General Zoology, vol. 5, pt. 1, p. 350, 1804 (type locality: Beaumaris, Anglesea, England) (on Pennant, British Zoology, ed. 2, vol. 4, p. 92, 1769).

Squalus sealonus (Walker) LEACH, Wernerian Soc. Mem., vol. 2, p. 64, pl. 2, fig. 2, 1812 (type locality: Lochfyne).

Sealanonius walkeri FLEMING, British Animals, p. 169, 1828 (on Leach).

Lamna philippi PEREZ, Estudios sobre algunos escualos de la costa de Chile, p. 1, 1886 (type locality: Chile).—PHILIPPI, Anal. Univ. Chile, vol. 71, p. 17, pl. 3, fig. 2 1887 (Chile).—QUIJADA, Boll. Mus. Chile, vol. 5, pt. 1, p. 111, 1913 (Chile).

Depth 6⅓ to subcaudal; head 5, width 3. Snout 2⅖ in head; eye 7¾, mouth gape 2⁵⁄₇ in head, narrowly convergent, without folds or grooves; teeth 28 above, 26 below, directed inward, most with single, minute basal cusp each side; nostrils moderate, at last sixth in snout, inferior, well separated, internarial twice space between each one and front mouth edge; nasal valve very small; interorbital 3¾, broadly depressed. First gill opening longest or 1⅔ in head, last before pectoral base.

Scales rather rough to touch.

Front edge of first dorsal 2⅖ in head; of second dorsal 4³⁄₇; anal length 4; front subcaudal edge 1½; least depth of caudal peduncle 9; pectoral 1¼, width half its length, which 1⅗ to ventral; ventral length 3 in head.

Gray brown above, pale or whitish below, line of demarcation along side of caudal peduncle well contrasted by caudal keel. Dorsal fins and upper surface of caudal like back, lower pale like belly, though with more or less grayish. Pectoral above like back, below paler like belly. Ventral and anal pale, slightly with grayish. Iris pale olive gray, eyeball whitish. Teeth whitish.

Widely distributed in the Atlantic. Known from Japan, Kamchatka, Alaska, California, and Chile in the Pacific. I have no Pacific materials.

1 example. A.N.S.P. Italy. C. L. Bonaparte collection. Length, 623 mm.

LAMNA WHITLEYI Phillipps

Lamna whitleyi PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 16, p. 239, fig. 3, 1935 (type locality: Island Bay, Wellington, New Zealand).

Oxyrhina gomphodon (not Müller and Henle) CROSS, Proc. Roy. Soc. Tasmania, vol. 3, pt. 1, p. 81, 1855 (coast of Australia and New Zealand).

Lamna cornubica (not Gmelin) HAAST, Trans. New Zealand Inst., vol. 7, p. 237, 1875 (Banks Peninsula and Lyttelton, New Zealand).—JOHNSTON, Pap. Proc. Roy. Soc. Tasmania, 1882, p. 138, 1883; 1887, pp. xxxii, 46, 1888; 1890, p. 38, 1891 (Tasmania).—OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1771, 1889.—KENT, Naturalist in Australia, p. 154, 1897.—WOODWARD, Western Australia Year Book, vol. 1, 1900–1901, p. 273, 1902 (Western Australia).

Lamna nasus (not Bonnaterre) WAITE, Rec. Canterbury Mus., vol. 1, No. 1, p. 6, 1907 (New Zealand).—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 6, p. 267, figs. 11–12, 1924 (New Zealand).—MCCULLOCH, Australian Mus. Mem., vol. 5, p. 14, 1929 (reference).

Large teeth appear to have only basal cusp, and in very large teeth the cusps, though present, are not such a distinctive feature. Outer row of upper teeth almost straight and slope outward. The next upper row more twisted and slope more obliquely inward. Lower teeth 3 rows in front, all twisted in varying degrees toward upper row. Some few small teeth with 2 basal cusps on each side at base.

Dorsal origin just behind pectoral base. Second dorsal origin over hind part of anal base and farther back than in *Lamna nasus*. Pectoral base slopes obliquely downward.

Dull slaty on back and sides becoming lighter below, where general color seems rather light yellow, perhaps tinged with red. Eye deep green. (Phillipps.)

New Zealand. Said to have similar dentition to *Lamna nasus*, also the second dorsal originating over the anal, and the body stout. It agrees also with *Isurus tigris* in the position of its first dorsal and the length of its lower caudal lobe.

Genus CARCHARODON Müller and Henle

Carcharodon (Andrew Smith) MÜLLER and HENLE, Mag. Nat. Hist. Charlesworth, ser. 2, vol. 2, p. 37, 1838. (Type, *Carcharias verus* Blainville=*Squalus carcharias* Linnaeus, monotypic.)

Cycocephalus SCHAEFFER, Epistola studii ichth., p. 20, 1760. (Atypic. Type, *Squalus carcharias* Linnaeus.) (*Cynocephalus* Walbaum, 1792, Lacépède, 1799, not involved.)

Carcharoles JORDAN, Stanford Univ. Publ. Biol. Sci., vol. 3, p. 99, 1923. (Type, *Carcharias auriculatus* Blainville.) (Fossil.)

Body fusiform, massive forward. Caudal peduncle strong, depressed, lateral keel each side. Head conic. Snout produced. Eye moderate; pupil erect, no nictitating fold. Mouth large, crescentic, with labial folds. Teeth compressed, large, erect, regularly triangular, edges serrated, broader in upper jaw of which third tooth on each side small. Nostrils small, widely separated, nearer mouth and eye than snout end. Gill openings wide, before pectoral. Spiracle minute or absent. First dorsal large or moderate, nearly midway between pectorals and ventrals. Second dorsal and anal very small.

Caudal axis greatly elevated backward, lobes of lunate fin not very unequal. Caudal pits present. Pectorals large, falciform. Ventrals small.

Large pelagic sharks, found in all warm seas, though fortunately nowhere met with in abundance, as they are among the strongest and most voracious of all fishes. Fossils known from large detached teeth, some from the bottom of the ocean and of 5 or more inches in length, indicating these fishes have been more abundant in early times than at present. Various Tertiary deposits have also disclosed quantities of large shark teeth of the white shark type. These giants were surely the largest of all fishes, having been estimated over twice the length of the largest living basking sharks or whale sharks. Bowerbank estimated their total length upward of 88 feet. Such monsters must have rendered incessant the butchery of the majority of other aquatic animals.

CARCHARODON CARCHARIAS (Linnaeus)

Squalus carcharias LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 235, 1758 (type locality: Europe); ed. 12, vol. 1, p. 400, 1766.—FORSKÅL, Descript. Animal., pp. VIII, 20, 1775 (Djedda).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1498, 1789 (oceano abysso).—WALBAUM, Artedi Pisc., vol. 3, p. 514, 1792 (copied).—FORSTER, Fauna Indica, p. 18, 1795—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 169, pl. 8, fig. 1, 1798 (Africa).—BLUMENBACH, Handb. Naturg., p. 257, 1799. —SCHNEIDER, Syst. Ichth. Bloch, p. 132, 1801 (copied).—CUVIER, Règne animal, vol. 2, p. 126, 1817 (reference).—LICHTENSTEIN, Descript. Anim. Forster, p. 256, 1844 (Tanna Island).—KITTLITZ, Denkw. Reise Mikronesien, vol. 2, p. 188, 1858 (Bonin Islands).—G. BENNETT, Gatherings Nat. Australasia, p. 26, 1860 (Australia).—JOUAN, Mém. Soc. Imp. Sci. Nat. Cherbourg, vol. 8, p. 245, 1861 (New Caledonia).

Carcharodon carcharias OGILBY, Handbook of Sydney, p. 117, 1898.—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 127, 1901 (off Tokyo).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 624, 1903 (off West Hondo near Misaki).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), pt. 1, p. 44, 1905 (Puna, Hawaii).—WAITE, Rec. Canterbury Mus., vol. 1, p. 6, 1907 (reference).—STEAD, Fishes of Australia, p. 233, 1908.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 32, pl. 5, figs. 5–9, 1913 (Massachusetts Bay).—OGILBY, Mem. Queensland Mus., vol. 5, p. 74, 1916 (Note).—WAITE, Rec. South Australian Mus., vol. 2, No. 1, p. 21, fig. 28, 1921.—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 6, p. 269, fig. 14, 1924 (New Zealand).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 102, 1925 (off Ize).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—FOWLER, Proc. Acad. Nat. Sci., Philadelphia, 1925, p. 190 (Bluff Channel, Natal).—BARNARD, Ann. South African Mus., vol. 21, p. 33, pl. 1, fig. 7, 1925 (Cape Seas).—HERRE, Philippine Journ. Sci., vol. 26, p. 114, 1925 (Camiguin Strait; Malampaya Sound, Palawan).—MCCULLOCH, Fishes New South Wales, ed. 2, p. 8, pl. 2, fig. 23a, 1927.—FOWLER, Mem. Bishop Mus., vol. 10, p. 18, fig. 3, 1928 (Hawaiian Islands); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 488, 1930 (Hawaii, Atlantic and Indian Oceans). —SOLDATOV and LINDBERG, Bull. Pac. Sci. Fisher. Inst., vol. 5, p. 12, 1930 (Far East Seas).—TANAKA, Jap. Fish. Life Colours, No. 20, 1933.—FOWLER, Bull. Amer. Mus. Nat. Hist. New York, vol. 70, pt. 1, p. 31, 1936 (New Jersey).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 12, 1937 (reference).

Carcharhinus carcharias WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference; New Zealand).

Carcharis lamia RAFINESQUE, Caratteri animali piante Sicilia, p. 44, 1810 (on Linnaeus).

Carcharodon verus AGASSIZ, Poissons fossiles, vol. 3, pl. F, fig. 3, 1836, p. 91. 1838 (on "*Carcharodon smithii* Müller and Henle").

Carcharodon capensis ANDEW SMITH, Proc. Zool. Soc. London, p. 86, 1837 (type locality: Cape of Good Hope); Ill. zool. South Africa, Fishes, pl. 4, 1849 (Cape of Good Hope).

Carcharodon smithii BONAPARTE, Mém. Soc. Sci. Neuchâtel, vol. 2, p. 9, 1839 (on Smith).

Carcharodon rondeletii MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 70, 1841 (type locality: Mediterranean, Atlantic, Cape Seas, Pacific Ocean).—GRAY, List fish British Museum, p. 61, 1851 (Cape Seas).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 411, pl. 7, fig. 7, 1865 (teeth) (America, Algeria).—GÜNTHER, Cat. Fishes British Mus., vol 8, p. 392, 1870 (Cape Seas; Port Fairey ?, Australia).—HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 78, 1872.—KLUNZINGER, Sitzungsber. Akad. Wiss., Wien, math-nat. Cl., vol. 80, pt. 1, p. 426, 1880 (Australia).—RAMSAY, Proc. Linn. Soc. New South Wales, vol. 5, pt. 1, p. 96, 1880 (Port Jackson).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 358, 1881 (Australian Seas, Port Jackson).—MCCOY, Prodromus Zool. Victoria, dec. 7, pl. 74, 1883.—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 5, 1888 (Port Jackson); Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1771, 1888 (New South Wales to Broken Bay).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 43, 1890 (reference).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 485, 1910 (between Polynesia and western South America).—QUIJADA, Boll. Mus. Nac. Chile, vol. 5, pt. 1, p. 111, 1913 (Chile).

Carcharias atwoodi STORER, Proc. Boston Soc. Nat. Hist., vol. 3, p. 72, 1848 type locality: Provincetown, Mass.).

Depth 4⅗ to subcaudal origin; head 4, width 1⅘. Snout 3¾ in head; eye 12½, 3¼ in snout, about 4¾ in interorbital; mouth width 2⅘ in head, length 1⅗ its width; teeth in 26 rows above, 24 below, internarial 1⅓ in preoral, which 4¼ in head; interorbital 2¾, rather low. Third gill opening 2⅖, deepest, interspace between first and second broadest, last 2 closest.

Scales small, tricarinate.

First dorsal inserted close behind pectoral base, front edge 1½ in head; second dorsal base entirely before anal base, fin length 5¾; anal length 5⅔; subcaudal length 1¼; ventral length 2⅛; pectoral length equals head to second gill opening, width 2⅓ its length, reaches 1⅓ to ventral; upper caudal lobe slightly longer than head to first gill opening.

Back slaty brown, shading to white on sides and beneath. Black spot in pectoral axil, followed by white on body and fin. Fins darkened backward except ventrals, which olive on front portions and elsewhere white. Length, 2163 mm. (Garman.)

Red Sea, Natal, Cape Colony, China, Japan, Kamchatka, Queensland, New South Wales, Victoria, South Australia, New Zealand, Melanesia, Micronesia, Polynesia, Hawaii. Elsewhere in the Pacific known also from California and Chile, besides being widely distributed in the temperate and torrid Atlantic. This is evidently the largest and most formidable of all animals known to man, surely of sharks or fishes. Reports or stories of its man-eating exploits are legion, doubtless many of them in some measure authentic. Likely the man eater is the "great fish" in the story of Jonah. Persons washed or fallen overboard from vessels have been devoured or swallowed entire. A large shark of this species caught near Soquel, Calif., was about 30 feet long and contained in its stomach a young sea lion that weighed about 100 pounds. According to the late Russell J. Coles, the white shark feeds largely on fishes, though with age it seems to specialize on other food, often sea turtles. He expresses the opinion that few white sharks ever attack man or look on him as food, but having once done so, as by chance, such a shark immediately becomes very dangerous.

Family HALSYDRIDAE

The Basking Sharks

Body massive, elongate. Caudal peduncle restricted, with keel each side. Head very large. Snout produced. Eye small, without nictitating membrane. Mouth large. Teeth very small, numerous, conic, without cusps or serratures. Nostrils near mouth. Gill openings very wide, extend from front of back nearly down to median line of throat, all before pectorals. Spiracle small, above mouth corner. Brain very small. First dorsal large, midway between pectorals and ventrals. Second dorsal and anal small. Caudal lunate, upper lobe longer. Caudal with pits. Pectorals and ventrals large.

Huge sharks, among the largest of living fishes, pelagic, living in the glacial and temperate seas of the antipodes. Fragmentary fossils, chiefly vertebrae and teeth, known from the Cretaceous and later formations.

Genus HALSYDRUS Fleming

Halsydrus Fleming, Scots Mag., 1809, p. 7; Edinburgh Encycl. Brewster, vol. 11, p. 713, 1817; Philos. Zool., vol. 2, p. 380, 1822. [Type, *Halsydrus pontoppidiani* Fleming (on *Sea Serpent* Stronsay, Orkney Islands=*Squalus maximus* Gunner).]

Tetroras Rafinesque, Caratteri animali piante Sicilia, p. 11, 1810. (Type, *Tetroras angiova* Rafinesque=*Squalus maximus* Gunner, monotypic.)

Tetnoras Rafinesque, Analyse de la nature, p. 93, 1815. (Type, *Tetroras angiova* Rafinesque.)

Cetorhinus BLAINVILLE, Bull. Soc. Philom. Paris, 1816, p. 121. (Type, *Squalus gunneri* Blainville=*Squalus maximus* Gunner, designated by Gill, Ann. Lyceum Nat. Hist. New York, 1861, p. 32.)

Ceteorhinus AGASSIZ, Nomencl. Zool., Index, p. 75, 1846. (Type, *Squalus gunneri* Blainville.)

Selache CUVIER, Règne Animal, vol. 2, p. 129, 1817. (Type, *Squalus maximus* Gunner, designated by Jordan and Evermann, Genera of fishes, pt. 1, p. 97, 1917.)

Selanche JAROCKI, Zoologii, vol. 4, p. 452, 1822. (Type, *Squalus maximus* Gunner.)

Selachus MINDING, Lehrb. Naturg. Fische, p. 52, 1832. (Type, *Squalus maximus* Gunner.)

Polyprosopus COUCH, British Fishes, vol. 1, p. 67, 1867. (Type, *Squalus rashleighanus* Couch, designated by Jordan, Genera of Fishes, vol. 3, p. 313, 1919.)

Hannovera BENEDEN, Bull. Acad. Roy. Sci. Belge, ser. 2, vol. 31, p. 504, 1871. (Type, *Hannovera aurata* Beneden, monotypic.)

Body partly fusiform, slenderer behind dorsal fin. Snout conic, moderate. Eye above forward end of mouth, small. Mouth large, curved forward. Teeth subconic, generally curved and directed inward toward throat. Gill openings with strainers, apparently modified teeth or scales and suggestive of whalebone. Caudal large, vertebral, axis raised, subcaudal lobe much produced. Ventrals rather small. Claspers of male with bony denticles.

These large sharks feed on minute forms of life, which are strained from the sea water by means of their peculiar gill rakers. Their great size, rivaling that of whales, doubtless added to their confusion with these animals has given rise to fables that they devoured dolphins, humpbacks, rorquals, etc. "The Basking Shark is a peaceable and sluggish creature, harmless to man or other animals of any magnitude, and asserting its presence only by roving in quest of food at the surface, sometimes with snout above the water. When it accelerates its pace, cleaving the water with the projecting dorsal and caudal fins, and when it swims in a company of several, one behind another, it presents an appearance that may well have dictated an occasional contribution to the history of the great sea serpent. Or the same phenomenon may be suggested to the imagination by a sight of this fish as it lies during calm weather in repose at the surface, often with the belly upwards, and as the waves lap its rotund body . . . Yet extremes meet, even in the temperament of the Basking Shark; and it has sometimes been seen to leap several feet out of the water." (Smitt.)

HALSYDRUS MAXIMUS (Gunner)

Squalus maximus GUNNER, Selsk. Skrift. Trondhjem, vol. 3, p. 33, pl. 2, fig. 1, 1765 (type locality: Trondhjem).—CUVIER, Règne Animal, vol. 2, p. 129, 1817 (reference).

Cetorhinus maximus Gray, List fish British Museum, p. 61, 1851 (compiled).—McCoy, Prodromus Zool. Victoria, dec. 11, pl. 104, 1885.—Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1772, 1888 (off Portland, Victoria); Cat. Fishes Australian Mus., pt. 1, p. 6, 1888 (Portland, Victoria).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 45, 1890 (reference).—Waite, Rec. Australian Mus., vol. 4, p. 263, 1902 (Twofold Bay, New South Wales).—Stead, Fishes of Australia, p. 233, 1908.—Waite, Rec. South Australian Mus., vol. 2, no. 1, p. 22, fig. 29, 1921.—Phillipps, New Zealand Journ. Sci. Techn., vol. 6, p. 266, fig. 10, 1924 (Davenport, Auckland record).—Barnard, Ann. South African Mus., vol. 21, p. 34, pl. 2, figs. 1–1a, 1925 (Agulhas Bank).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 102, 1925 (Yamada Museum, Japan).—McCulloch, Fishes New South Wales, ed. 2, p. 8, pl. 2, fig. 24a, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 489, 1930 (California; Atlantic).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 13, 1930 (Far East Seas).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 243, fig. 13, 1932 (Yingtau, a small island near Tsingtau).—Tanaka, Jap. Fish. Life Colours, no. 21, 1933.—Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 94, 1933 (Chusan).—Barnard, Ann. South African Mus., vol. 32, pt. 2, p. 43, pls. 6–7, text fig. 1, 1937 (Table Bay; Hout Bay).

Selache maxima Macleay, Proc. Linn. Soc. New South Wales, vol. 9, p. 62, 1884 (Victoria coast).—Kershaw, Victorian Nat., vol. 19, p. 62, pl., 1902 (Victoria).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 39, 1913 (Arctic seas to temperate region).—Gudger, Science, new ser., vol. 42, p. 653, 1915 (in southern hemisphere).

Halsydrus maximus Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 196, pl. 29, figs. 1–3, 1934 (reference).

Tetroras angiova Rafinesque, Caratteri animali piante Sicilia, p. 11, 1810 (type locality: Sicily).

Squalus gunnerianus Blainville, Journ. Physique Chim. Hist. Nat. Paris, vol. 71, p. 256, pl. 2, fig. 3 (outline), 1810 (on Gunner).

Cetorhinus gunneri Blainville, Bull. Soc. Philom., Paris, 1816, p. 121 (name only).

Squalus pelegrinus Blainville, ibid., 1810, p. 256, pl. 2, fig. 2 (outline) (on Pennant; specimen in Paris Museum).

Cetorhinus peregrinus Blainville, ibid., 1816, p. 121 (name only).

Squalus homianus Blainville, ibid., p. 257, pl. 2, fig. 1 (outline), 1810 (on Home, 1809).

Cetorhinus homianus Blainville, ibid., 1816, p. 121 (name only).

Cetorhinus shavianus Blainville, ibid., 1816, p. 121 (name only).

Squalus isodus Macri, Atti Accad. Sci. Napoli, vol. 1, pp. 55, 56, pl. 1, fig. 1, pl. 2, fig. 2, 1819 (type locality: Capri).

Squalus rostratus Macri, Atti Accad. Sci. Napoli, vol. 1, p. 76, pl. 1, fig. 2, 1819 (type locality: Messina).

Squalus elephas Lesueur, Journ. Acad. Nat. Sci. Philadelphia, vol. 2, p. 243, pl., 1822 (type locality: Browns Point in Raritan Bay, N. J.)

Squalus rhinoceros (Mitchill) De Kay, New York Fauna, p. 358, vol. 3, 1842 (on Mitchill's account of Maine example).

Squalus cetaceus Gray, Cat. Fish. Gronow, p. 6, 1854 (type locality: Norwegian Sea).

Polyprosopus macer Couch, Fish. British Islands, vol. 1, p. 68, pl. 15, fig. 2, fig. (head), 1862 (type locality: Menabilly, Cornwall).—Gill, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 199 (monstrosity).

Squalus rashleighanus COUCH, *idem.*

Acanthias blainville (not Risso) CAPELLO, Piex. Plagiostomes, vol. 1, p. 21, 1866.

Sclachi pennantii CORNISH, Zoologist, vol. 43, p. 351, 1885 (type locality: Mounts Bay).

Halsydrus maccoyi WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 197, 1934 (McCoy's example; Williamstown; southern New South Wales; Mungo Beach; Davenport, New Zealand; Whangaparaoa Peninsula; Kapiti Island; Wairoa; Makara; off Wellington).

Depth 5¾ to subcaudal origin; head 4⅞. Snout 5⅓ in head; eye 11, 11½ in snout; mouth cleft 1⅞ in head; teeth small, very numerous, 6 or more series functional, smooth edged; nostrils small, near sides of snout close to mouth; interorbital low. Front pair of gill openings narrowly separated on back and on throat.

First dorsal inserted little behind inner angle of pectoral, front edge 1¼ in head; second dorsal length 2; anal length 2⅖, inserted behind second dorsal base; subcaudal 1⅖ in head; pectoral 1½, width 1⅓ its length, which reaches 2⅘ to ventral; ventral length 1⅗ in head, clasper reaches anal; caudal length 3⅖ in rest of body.

Back grayish brown, lower surfaces white. Reaches 10,675 mm. (35 feet). (Waite; Garman.)

South Africa, China, Japan, New South Wales, Victoria, South Australia, New Zealand. Also from the Eastern Pacific in California, Ecuador and Peru, besides in the cooler Atlantic.

U.S.N.M. No. 27024. Monterey, Calif. D. S. Jordan.

Family RHINCODONTIDAE

Body massive, body cavity more than half total length. Tail with lateral keel each side. Head wide. Snout broad, subtruncate. Eyes small, lower lid without fold. Mouth large, wide, transverse. Teeth very small, subconic, curved. Nasoral grooves present. Gill openings wide, last 2 above pectoral. Spiracle small. Two dorsals, spineless, with produced angles. Anal very small. Caudal erect, with pit, subcaudal large. Pectorals large.

Large sharks, pelagic in tropical seas.

Genus RHINCODON Andrew Smith

Rhincodon ANDREW SMITH, Zool. Journ., 1829, p. 443. (Type, *Rhincodon typus* Andrew Smith, monotypic.)

Rhineodon MÜLLER and HENLE, Mag. Nat. Hist. Charlesworth, vol. 2, p. 37, 1838. (Type, *Rhincodon typus* Andrew Smith.)

Rhiniodon SWAINSON, Nat. Hist. Animals, vol. 2, p. 317, 1839. (Type, *Rhincodon typus* Andrew Smith.)

Rhinodon MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 77, 1841. (Type, *Rhincodon typus* Andrew Smith.)

Micristodus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1865, p. 177. (Type, *Micristodus punctatus* GILL, monotypic.)

Body partly fusiform. Head depressed. Snout obtuse. Eyes lateral, near mouth angle, without nictitating fold. Mouth anterior, with labial folds on both jaws. Teeth very numerous. Nostrils anterior, without cirri. Last gill opening narrower. Spiracle lateral. First dorsal before middle in total length, much larger than second, separated by more than length of base from second dorsal. Pectorals falciform.

These great sharks are apparently to be referred to a single species. When met with they rarely if ever make any attempt at defense, except by attempting to escape by slowly swimming away. Stories about its diving when harpooned and dragging a small boat with its crew down to the bottom are now discredited. Wright says, "It now and then rubs itself against a large pirogue as a consequence upsetting it, but, under such circumstances, it never attacks or molests the men, and while it reigns as a monster among sharks, is not, spite its size, as formidable as the common dog fish."

Specimens have been recorded between 14 and 45 feet in length. Like the basking shark its food is the plankton or minute creatures strained from the sea water by means of its modified gills. It is supposed to be viviparous.

RHINCODON TYPUS Andrew Smith

Rhincodon typus ANDREW SMITH, Zool. Journ., vol. 4, p. 443, 1829 (type locality: Table Bay, South Africa).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 42, (Cape of Good Hope; Japan; Florida), p. 456 (Knights Key, Fla.), 1913.—HERRE, Philippine Journ. Sci., vol. 26, p. 116, pl. 1, 1925 (Argao, Cebu; Bacolod, Occidental Negros; Manila Bay).

Rhinodon typicus MÜLLER, and HENLE, Syst. Beschr. Plagiostomen, p. 77, pl. 35, fig. 2, 1841 (teeth) (Cape of Good Hope).—ANDREW SMITH, Ill. zool. South Africa, Fishes, pl. 26, 1849 (Capetown).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 428, 1865 (type).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 396, 1870 (Seychelles).—HALY, Ann. Mag. Nat. Hist., ser. 5, vol. 12, p. 48, 1883 (Seychelles).—THURSTON, Bull. Madras Mus., No. 1, pl. 3a, 1884.—DAY, Fishes of India, Suppl., p. 811, 1888 (Ceylon); Fauna Brit. India, Fishes, vol. 1, p. 29, 1889.—BRIDGE, Cambridge Nat. Hist. Fishes, vol. 7, p. (287) 454, 1904.—B. A. BEAN, Smithsonian Misc. Coll., vol. 48, pt. 2, p. 139, pls. 34–36, figs. 17–21, 1905 (historical).—(WARD) FOUNTAIN, Rambles Austral. Nat. p. 119, 1907 (Great Australian Bight).—REGAN, Proc. Zool. Soc. London, 1908, p. 353 (Ceylon; Seychelles).—LLOYD, Rec. Indian Mus., vol. 2, p. 306, 1908 (head of Bengal Bay).—VAN KAMPEN, Nat. Tijdschr. Nederland. Indië, vol. 67, p. 124, 1908 (north coast of Java).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 486, 1910 (Florida, Cape of Good Hope, Seychelles, Ceylon, Madras, Japan, California, Panama, Peru, Chile).—H. M. SMITH, Proc. Biol. Soc. Washington, vol. 24, p. 97, 1911 (Negros Occidental, Philippines).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E44, E49.—JORDAN, Science, March 26, 1915, p. 46 (Cebu).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 593, 1913 (compiled).—BARNARD, Ann. South African Mus., vol. 21, p. 37, pl. 2, fig. 3, 1925 (from Dean) (compiled).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 351, 1929 (Travancore).—TANAKA, Jap. Fish. Life Colours, no. 24, 1933.

Rhineodon typicus GRAY, List. fish British Museum, p. 67, 1851 (reference).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 626, 1903 (on Kishinouye.)

Rhinodon typus SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 511, 1891 (reference).

Rhinodon typicus ELERA, Cat. Fauna Filip., vol. 1, p. 615, 1895 (Luzon, Manila).

Rhineodon typus GUDGER, Zoologica, vol. 1, p. 349, 1915 (natural history); Science, new ser., vol. 48, p. 622, 1918 (records).—FOWLER, Mem. Bishop Mus., vol. 10, p. 18, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 488, 1930 (Atlantic record).—BARNARD, Ann. South African Mus., vol. 30, p. 647, pl., 1935.—CHEVEY, Inst. Oceanogr. Indochine, 28^e Note, Station Maritime de Cauda Annam, pp. 1–32, 1936 (Cochinchina).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 12, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 2, 1937 (Gulf of Siam).

Micristodus punctatus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1865, p. 177 (type locality: Gulf of California) (teeth).—MOWBRAY, Sci. Cruise *Nourmahal*, Vincent Astor, No. 1, 1933 (Elizabeth Bay, Albemarle Island, Galapagos).

Setache maxima (not Gunner) J. THOMAS, Cannibals and Convicts Experience Western Pacific, p. 380, 1887 (Red Scar Bay, Southern New Guinea).

Rhinodon pentalineatus KISHINOUYE, Zool. Anz., vol. 24, p. 694, figs., 1891 (type locality: Cape Inul, Japan); Dobuts. Zasshi, Tokyo, vol. 15, p. 41, fig., 1903 (Japan).

Depth 5½ to subcaudal origin; head 5½. Snout 2⅛ in head; eye 13½, 5¼ in snout; mouth cleft about 3¼ in head, upper labial fold longer than lower; teeth in 250 to 300 rows in jaws, 12 to 15 transversely; nostrils at snout end near lip, front valves widely separated, reaching teeth; interorbital moderately elevated, wide. Gill openings nearly equidistant, third largest or 1½ in head.

Pair of keels or ridges on each flank begin above gill arches, upper to interdorsal, lower meeting caudal peduncle keel.

Front edge of first dorsal 1¼ in head; second dorsal length 1⅞; anal length 2⅔, begins close behind second dorsal base; ventral length 2¼; caudal 3 in rest of body, subcaudal 4⁹⁄₁₀; pectoral 3⅔ in body to subcaudal origin, width half its length which 1½ to ventral.

Purplish to reddish brown, profusely sprinkled with spots and streaks of white. Lower surfaces light reddish brown. (Bean; Garman.)

South Africa, Seychelles, India, Ceylon, East Indies, Philippines, Japan, Australia. Also in the Eastern Pacific in California, Panama, Peru, Chile, and the tropical Atlantic. I have not examined any Pacific specimens.

U.S.N.M. No. 50227. Near Ormond, Fla. Anderson and Price.

Family PSEUDOTRIAKIDAE

Body longer than tail. Snout rounded, depressed. Eyes lateral, without nictitating folds. Mouth wide, very large. Teeth numerous, small, tricuspid. Nostrils inferior, separate from one another and from mouth. Gill openings moderate, last above pectoral.

Spiracle moderate. Skin with minute scales. First dorsal above body cavity, before ventrals. Second dorsal larger than anal. Anal present. Caudal moderate, without pits and low subcaudal lobe not prominent. Paired fins moderate.

A family of large sharks, found in deep water. They are distinguished chiefly by the long, low, first dorsal.

Genus PSEUDOTRIAKIS Capello

Pseudotriakis CAPELLO, Jorn. Sci. Math. Phys. Nat. Lisboa, vol. 1, p. 321, 1868. (Type, *Pseudotriakis microdon* Capello, monotypic.)

Pseudotriacis GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 395, 1870. (Type, *Pseudotriakis microdon* Capello.) (Emendation.)

Body elongated. Snout short, tapering, end blunt. Eyes oblong. Mouth with short labial folds around angles on both jaws. Teeth with strong median cusp and small lateral cusps. Nostrils near mouth. Spiracle behind eye. First dorsal longer than second, long, low, gradually elevated posteriorly. Second dorsal behind ventrals, opposite and like anal. Anal below second dorsal and smaller. Pectoral short, wide.

PSEUDOTRIAKIS MICRODON Capello

Pseudotriakis microdon CAPELLO, Jorn. Sci. Math. Phys. Nat. Lisboa, vol. 1, pp. 315, 321, pl. 5, fig. 1, 1868 (type locality: Setubal, Portugal).—T. H. BEAN, Proc. U. S. Nat. Mus., vol. 6, p. 147, 1883 (Amagansett, Long Island).—GOODE and BEAN, Oceanic ichthyology, p. 18, pl. 5, fig. 17, 1895 (Long Island example).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 104, 1913 (Portugal and New York).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 489, 1930 (Japan; Atlantic).

Pseudotriacis microdon GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 395, 1870 (copied).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 464, 1908 (Portugal).

Pseudotriakis acrales JORDAN and SNYDER, Smithsonian Misc. Coll., vol. 45, p. 232, pl. 62, 1904 (type locality: Suruga Bay, Japan).

Pseudotriacis acrales REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 465, 1908 (note).

Pseudotriakis acrages GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 104, 1913 (Pacific near Japan).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 102, 1925 (note).

Depth 6⅕ to subcaudal; head 4⅕. Snout 2⅗ in head; eye 6, 2⅕ in snout; deep fold below eye; mouth gape 2½ in head; preoral length 3; teeth in oblique rows, upper widely spaced posteriorly, edges serrated; internarial 4⅕ in head; interorbital 2⁴⁄₇, low. Gill rakers equidistant, subequal. Spiracle less than eye diameter behind eye.

Scales minute, leaflike prickles, each with strong, elevated midrib.

Second dorsal higher than first, fin length 1⅒ in head; anal length 1¼; least depth of caudal peduncle 4; pectoral 1⅗, width 1⅗ its length, which reaches 3 to ventral origin; ventral length 2 in head; front subcaudal edge 1⅔; caudal 4$\frac{1}{10}$ in rest of body; first dorsal length 3½.

Dark gray above and below. Fins, including first dorsal edged blackish. Length, 1,720 mm. (Jordan and Snyder.)

Japan. Also in the Atlantic. According to Regan reaches 3,000 mm.

Family CARCHARIIDAE

Body rather elongated, compressed. Tail long, compressed, without lateral fold. Head depressed, tapering. Snout short, sharp; tapering. Eyes small, without nictitating folds. Mouth wide, large, greatly arched, labial fold on lower jaws. Teeth awl-shaped, large, long, slender, narrow, bases 2-rooted. Nostrils transverse. Gill openings wide, before pectoral. Spiracle small. Two dorsals, moderate, first dorsal median or little behind middle in trunk, second dorsal and anal rather large. Caudal elongate, with notch at tip. Caudal pits present. Pectorals rather short.

Sharks of large or moderate size, very voracious. Many fossils have been described from the Eocene and later deposits.

ANALYSIS OF GENERA

a^1. CARCHARIINAE. Snout short; mouth somewhat protractile; dorsals, ventrals and anal subequal; upper caudal pit distinct; subcaudal produced. Carcharias

a^2. SCAPANORHYNCHINAE. Snout extended; mouth greatly protractile; dorsals smaller than ventrals and anal; caudal pit indistinct; subcaudal not produced-- Scapanorhynchus

Genus CARCHARIAS Rafinesque

Carcharias RAFINESQUE, Caratteri animali piante Sicilia, p. 10, 1810. (Type, *Carcharias taurus* Rafinesque, monotypic.)

Odontaspis AGASSIZ, Recherches poiss. foss., vol. 3, p. 55, 1835; Poissons fossiles, vol. 3, pp. 87, 306, 1836. (Type, *Squalus ferox* Risso, monotypic.)

Triglochis MÜLLER and HENLE, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 113. (Atypic.) (Type, *Carcharias taurus* Rafinesque, Arch. Naturg., 1837, p. 396, monotypic.)

Eugomphodus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 60. (Type, *Squalus littoralis* Mitchill=*Carcharias taurus* Rafinesque, monotypic.)

Oxytes GIEBEL, Fauna Vorwelt, Fische, p. 364, 1847. (Type, *Oxytes obliqua* Giebel, monotypic.) (Fossil.)

Synodontaspis WHITE, Vertebrate Faunas English Eocene, p. 51, 1931. (Type, *Carcharias taurus* Rafinesque.)

Parodontaspis WHITE, op. cit., p. 63. (Type, *Odontaspis platensis* Lahille.)

Body partly fusiform. Tail with vertebral axis nearly horizontal. Head moderate. Teeth with or without denticles each side of large median cusp. Gill openings low, subinferior. Spiracle behind eye.

First dorsal above space between pectorals and ventrals. Subcaudal followed by shallow notch, lobe moderately produced.

Species few, in most warm seas. I have not consulted the account of *Carcharias kamoharai* Matsubara (Dobuts. Zasshi, Tokyo, vol. 48, p. 380, 1936).

ANALYSIS OF SPECIES

a^1. Teeth with basal denticle each side of long median cusp; caudal 3½ to 4½ in total length.
  b^1. First upper tooth smaller than second; 40 to 45 rows of upper teeth, 36 to 40 lower; first dorsal before ventrals________________________ taurus
  b^2. First upper tooth equals second; 32 to 34 rows of upper teeth, 30 to 34 lower; first dorsal partly over ventrals______________ tricuspidatus
a^2. Teeth without denticles; caudal nearly ⅓ total length______________ owstoni

CARCHARIAS TAURUS Rafinesque

Carcharias taurus Rafinesque, Caratteri animali piante Sicilia, p. 10, pl. 14, fig. 1, 1810 (type locality: Sicily).—Waite, Mem., Australian Mus., vol. 4, p. 36, 1899 (Newcastle and Broken Bay, New South Wales).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 25, pls. 6, 41, 51, 1913 (Atlantic and Mediterranean).—Barnard, Ann. South African Mus., vol. 21, p. 36, pl. 2, fig. 2, 1925 (Cape Seas).—Giltay, Mem. Mus. Roy. Nat. Hist. Belg., Hors ser. 5, vol. 3, p. 7, 1933 (Dobo, Aru Is.).—Fowler, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 29, fig. 4, 1936 (New Jersey).

Odontaspis taurus Müller and Henle, Syst. Beschr. Plagiostomen, p. 73, 1841 (Mediterranean, Cape of Good Hope, Atlantic).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 417, 1865 (Algeria).—Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 217, 1872 (Victoria).—McCoy, Prodromus Zool. Victoria, dec. 61, p. 7, pl. 64, fig. 1, 1882 (Victoria).—Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1772, 1888 (New South Wales; Port Phillip).—Waite, Prelim. Rep. *Thetis* Exped., p. 38, 1898 (off Newcastle and Broken Bay, in 16 to 19 fathoms).—Weber, *Siboga* Exped., Fische, vol. 57, p. 593, 1913 (Leiwiu, Obi major).

Squalus americanus (not Shaw) Mitchill, Rep. Fish. New York, p. 27, 1814 (type locality: New York). (As a new species.)

Odontaspis americanus Günther, Cat. Fishes. British Mus., vol. 8, p. 392, 1870 (Cape of Good Hope, Tasmania).—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 358, 1881 (Port Jackson, Tasmania).—Ogilby, Cat. Fishes. Australian Mus., pt. 1, p. 5, 1888 (Port Jackson).—Boulenger, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—Zugmayer, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).

Squalus littoralis Mitchill, Amer. Monthly Mag. Crit. Rev., vol. 2, p. 328, 1818 (type locality: New York City).

Squalus macrodus Mitchill, Amer. Monthly Mag. Crit. Rev., vol. 2, p. 328, 1818 (type locality: New York).

Carcharias griseus Ayres, Proc. Boston Soc. Nat. Hist., vol. 1, p. 58, 1842 (type locality: Brookhaven, Long Island) (no description); Boston Journ. Nat. Hist., vol. 4, pp. 288, 293, pl. 12, fig. 4, 1844 (type).

Odontaspis cinerea (Macleay) Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, pt. 1, p. 96, 1880 (type locality: Port Jackson) (in footnote). (Name only.)

Lamna ecarinata HILGENDORF, Symbol. Physic. Hemprich Ehrenberg, p. 8, pl. 6, fig. 1, 1899 (type locality: Mediterranean; Alexandria).

Carcharias arenarius OGILBY, Ann. Queensland Mus., no. 10, p. 37, 1911 (type locality: Moreton Bay, Queensland); Mem. Queensland Mus., vol. 5, p. 73, 1916 (Moreton Bay).—WAITE, Rec. South Australian Mus., vol. 2, p. 19, fig. 23, 1921.—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—MCCULLOCH, Fishes New South Wales, ed. 2, p. 8, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (compiled).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference); Rec. Australian Mus., vol. 20, no. 1, p. 3, fig. 1, 1937 (Batemans Bay, New South Wales).

Depth 5¼ to subcaudal origin; head 4, width 1½. Snout 3⅖ in head; eye 12, 3¼ in snout, 5½ in interorbital; mouth gape 3¼ in head, 1⅗ in mouth width; preoral 4¾ in head; upper labial fold shorter than lower, which ⅖ to symphysis; 45 rows of teeth above, 38 to 40 rows below, decrease towards mouth corners, median enlarged cusp long, slender and edges sharp, also larger teeth with 3 or 4 small basal cusps, 2 on each side; nostril nearly midway in snout length, front valve with somewhat extended lobe near edge, internarial slightly less than preoral; interorbital 2½, little elevated, broadly convex. Third gill opening longest, 4 in head, nearly equidistant.

Scales rather rough to touch, each with 3 keels.

First dorsal before ventral, front edge 2⅗ in head; second dorsal before anal, front edge 3¾ in head; front anal edge 3; pectoral 1¾, width 1½ its length which 2⅘ to ventral; ventral length 2⅖ in head; caudal 3⅓ in rest of body; subcaudal front edge 2⅓ in fin.

Gray brown above, whitish below. Sometimes mottled or spotted obscurely with rusty or darker, also fin edges dark. Reaches 3,666 mm.

Arabia, South Africa, India, East Indies, Queensland, New South Wales, Victoria, South Australia, Tasmania. Also in the Atlantic. The above description is from West Atlantic (New Jersey) specimens in the Academy of Natural Sciences of Philadelphia.

CARCHARIAS TRICUSPIDATUS Day

Carcharias tricuspidatus DAY, Fishes of India, pt. 4, p. 713, pl. 186, fig. 1, 1878 (type locality: Kurrachee and Beloochistan); Ann. Mag. Nat. Hist., ser. 5, vol. 20, p. 389, 1887 (note).—OGILBY, Ann. Queensland Ms., no. 10, p. 37, 1911 (note).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 26, 1913 (India, Cape of Good Hope, South Australia).—WAITE, Rec. South Australian Mus., vol. 2, p. 19, fig. 24, 1921.—MCCULLOCH, Fishes New South Wales, ed. 2, p. 8, pl. 2, fig. 21b, 1927.—TIRANT, Service Océanogr. pêches Indo-Chine, 6ᵉ note, p. 61, 1929 (Phurochai).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (reference).—CHEVEY, Inst. Océanogr. Indochine, 19ᵉ note, p. 5, 1932 (Cochinchina).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45. no. 63, p. 7, 1935–36 (Bahia di Assab, Mar Rosso).

Odontaspis tricuspidatus Day, Fishes of India, Suppl., p. 810, 1888.—Day, Fauna Brit. India, Fishes, vol. 1, p. 27, fig. 8, 1889.—Stead, Fishes of Australia, p. 233, 1908.—Waite, Rec. South Australian Mus., vol. 2, p. 19, fig. 24, 1921.—McCulloch, Fishes of New South Wales, ed. 2, p. 8, pl. 2, fig. 21b, 1927.

Odontaspis tricuspitatus Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 241, fig. 12, 1932 (Chefoo).

Carcharias cuspidatus Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1767, 1888 (note on 2 half grown) (error).

Odontaspis americanus (not Shaw) Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 43, 1890 (reference).

Odontaspis taurus (not Rafinesque) Barnard, Ann. South Afric. Mus., vol. 21, pt. 1, p. 36, 1925 (part).

Depth 5 to subcaudal origin; head 3¾, width 1½. Snout 3⅖ in head; eye 9½, 2¾ in snout, 7 in interorbital; mouth cleft 2¾ in head, 1⅕ in mouth width; teeth in 32 to 34 rows above, 30 to 34 rows below, large, awl-shaped, smooth, small basal cusp each side; fourth upper tooth each side of symphysis much smaller than those next; lower median tooth either side of symphysis slender; nostrils nearer mouth than snout end, internarial equals preoral length; interorbital moderately high, width 1⅔ in head. Gill openings subequal, last before pectoral base.

Front edge of first dorsal 1⁹⁄₁₀ in head; of second dorsal 1⁹⁄₁₀; of anal 2¼, origin below first basal third of second dorsal; least depth of caudal peduncle 4⅓ in head; pectoral 1⅓, width 2½ in fin, which 1⅗ to ventral; ventral length 1⅗, origin below last fourth of first dorsal base; caudal 2⅓ in rest of body, subcaudal length 3⅕ in fin.

Brown above, dull white below. Length, 3,735 mm. (Day.)

South Africa, India, Indochina, New South Wales, South Australia. Day says it reaches 6,100 mm. (20 feet) and that his figure was made from a skin, described above.

CARCHARIAS OWSTONI Garman

Carcharias owstoni Garman, Mem. Mus. Comp. Zool., vol. 36, p. 24, 1913 (type locality: Japan).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 589, 1930 (Nagasaki); Hong Kong Nat., vol. 1, p. 87, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 487, 1930 (reference).

Odontaspis americanus (not Shaw) Peters, Monatsb. Akad. Wiss. Berlin, 1880, p. 926 (Ningpo).

Body fusiform, robust; head depressed. Snout medium, rather pointed, broader than deep; eye small, ⅓ preoral length of snout; mouth large, length ⅔ its width, outline broadly rounded in front; upper labial fold rudimentary, mere gash hidden by lip; lower labial fold nearly ⅓ jaw length; teeth small, lanceolate, slender, 2 rooted, first upper little smaller than second from middle, fourth upper very small and followed by vacant space, first lower small, bases without denticles at sides of cusps; nostrils transverse, nearer mouth than snout end, with short rounded prominence on inner half. Gill openings wide, last before pectoral, width equals snout length. Spiracle small, 3 times eye behind eye above mouth angle.

First dorsal inserted behind pectoral ends, fin end reaches opposite ventral origin, little larger than second dorsal, ventrals or anal, which sub-equal and somewhat less than pectoral; second dorsal like first, little shorter, base ¾ interdorsal space, front ⅔ of fin before anal; anal like second dorsal, base half its length from caudal; caudal depth ⅖ its length, upper edge curved, vertebral axis little raised, length nearly ⅓ of total; caudal peduncle compressed; front pectoral edge broadly curved, nearly twice length of hinder edge, inner angle much rounded; hind edges of all fins concave.

Grayish to ashy brown, irregularly spotted with rusty brown, lighter on lower surfaces. Borders of fins blackish. Length, 965 mm. (Garman.)

Japan. According to Garman this species is distinguished by having its teeth without basal denticles.

Genus SCAPANORHYNCHUS Woodward

Scapanorhynchus WOODWARD, Cat. Fossil Fish. Brit. Mus., vol. 1, p. 351, 1889. (Type, *Rhinognathus lewisii* Davis, virtually. *Scapanorhynchus* Woodward proposed to replace *Rhinognathus* Davis.) (Fossil.)

Rhinognathus (not Fairmaire, 1873) DAVIS, Trans. Roy. Dublin Soc., ser. 2, vol. 3, p. 480, 1887. (Type, *Rhinognathus lewisii* Davis.) (Fossil.)

Mitsukurina JORDAN, Proc. California Acad. Sci., ser. 3, vol. 1, p. 200, 1898. (Type, *Mitsukurina owstoni* Jordan, monotypic.)

Body elongate, slender, compressed. Tail without lateral folds. Snout greatly elongated, rostrum much produced. Eyes small, pupil vertically ellipsoid, without nictitating folds. Mouth protruded, inferior, large, with labial folds. Teeth long, slender, awllike, usually with pair of minute lateral cusps. Nostrils oblique, small. Gill openings wide. Spiracle present. First dorsal above space between pectorals and ventrals. Second dorsal small, placed immediately above long anal. Caudal long, notched below near end.

One living species in the Western Pacific and several fossils from the Cretaceous.

SCAPANORHYNCHUS OWSTONI (Jordan)

Mitsukurina owstoni JORDAN, Proc. California Acad. Sci., ser. 3, vol. 1, p. 200, pls. 11–12, 1898 (type locality: Misaki, Japan).—WOODWARD, Ann. Mag. Nat. Hist., ser. 7, vol. 3, p. 487, 1899 (note).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 336, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 40 (127), 1901 (Yokohama).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 621, pls. 26–27, 1903 (Japan).—DEAN, Science, new ser., vol. 17, p. 630, 1903 (additional specimens).—VAILLANT, Compt. Rend. Acad. Sci. Paris, vol. 138, p. 1517, 1904 (Japan).—JORDAN and SNYDER, Smithsonian Misc. Coll., vol. 45, p. 234, 1904 (Kozu; off Okinose; Izu).—B. A. BEAN, Proc. U. S. Nat. Mus., vol. 28, p. 815, figs. 1–2, 1905 (between Umezawa and Mayegawa, near Kosu, Sagami Bay, 150 to 200 fathoms).—ZIETZ, Trans. Roy. Soc. South Australia, vol. 32, p. 291, 1908 (near Murray River mouth).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 40, 1912 (Mororan).—WAITE, Rec. South Australian Mus., vol. 2, No. 1, p. 20, fig. 26, 1921 (Goolwa within Murray River mouth).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 102, 1925 (Sagami Sea).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Scapanorhynchus owstoni REGAN, Proc. Zool. Soc. London, 1906, p. 744 (stuffed example).—HUSSAKOFF, Bull. Amer. Mus. Nat. Hist., vol. 26, p. 258, text fig. 1A, fig. 2a–a¹, 1909 (dorsal views of head) (Japan).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 28, pls. 41, 51, 56, 1913 (Sagami Sea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java., p. 488, 1930 (reference).

Scapanorhynchus jordani HUSSAKOFF, Bull. Amer. Mus. Nat. Hist., vol. 26, p. 257, text fig. 1B, fig. 2b–b¹, c–c¹, pl. 44, 1909 (type locality: Japan).

Scapanorhynchus dofleini ENGELHARDT, Zool. Anz., vol. 39, p. 644, 1912 (type locality: Japan).

Depth 7½ to subcaudal origin; head 3⅓, width nearly 3. Snout about 2 in head; eye 18⅓, 11⅔ in snout, 5⅔ in interorbital; mouth length from upper jaw tip 4 in head, width about ⅔ its length; lower labial fold less than ¼ jaw length; teeth in 48 to 50 rows in jaws, slender, curved, bases double, crowded forward in jaws; nostrils small, inconspicuous, rather close before eye; interorbital about ⅓ of head, rather low. Gill openings subequal. Spiracle large as eye, posterior little over 2 eye diameters.

First dorsal inserted nearly midway between rostral tip and subcaudal origin; fin length about 3 in head; second dorsal length about 3¾; anal length about 2; pectoral 2⅖, width about 1⅗ its length, which 2 to ventral origin; ventral length 1¾ in head; caudal 2⅖ in rest of body, front subcaudal edge 3¼ its length.

Gray brown, paler below.

Japan, South Australia.

U.S.N.M. No. 50972. Between Umezawa and Mayegawa, near Kozu, Sagami Bay, Japan, in 150 to 200 fathoms. Alan Owston. February 26, 1903. Length, 3,355 mm.

Family ALOPIIDAE

Body moderately long, partly fusiform. Tail little more than half total length, without lateral keels. Head short, rounded. Eye large, without nictitating fold. Mouth crescentic, with labial folds. Teeth alike in two jaws, small, simple, flat, triangular. Nostrils transverse. Gill openings moderate. Spiracles present. First dorsal above space between pectorals and ventrals. Caudal with vertebral axis raised, pits at root. Pectoral very large. Ventrals rather large.

One genus. Fossils from the upper Tertiary. Among all fishes this shark is readily known by its very long, slender, arched tail, greater than the rest of the body.

Genus ALOPIAS Rafinesque

Alopias RAFINESQUE, Caratteri animali piante Sicilia, p. 12, 1810. (Type, *Alopias macrourus* Rafinesque, monotypic.)

Alopius SWAINSON, Nat. Hist. Animals, vol. 1, p. 91, 1838. (Type, *Alopias macrourus* Rafinesque.)

Vulpecula VALMONT, Dict. Hist. Nat., Paris, vol. 3, p. 740, 1768. (Species nonbinomial.) (Type, *Squalus vulpes* Gmelin.) (Inadmissible.)

Alopecias MÜLLER and HENLE, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 114. (Atypic.) (Type, *Alopias macrourus* Refinesque.)

Carcharhinus BLAINVILLE, Bull. Soc. Philom., Paris, 1816, p. 12. (Type, *Squalus vulpes* Gmelin, designated by Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1907, p. 63.)

Carcharorhinus AGASSIZ, Nomencl. Zool., Index, p. 65, 1846. (Type, *Squalus vulpes* Gmelin.)

Carcharinus GRAY, List fish British Museum, p. 43, 1851. (Type, *Squalus vulpes* Gmelin, virtually.) (Variant spelling.)

Charcharinus JORDAN and STARKS, Ann. Carnegie Mus., vol. 2, p. 430, 1917. (Type, *Squalus vulpes* Gmelin.)

Body robust, slightly compressed. Snout partly conic, short, obtuse. Pupil vertical. Mouth large. Teeth compressed, edges entire, bases two-rooted. Nostrils small, nearer mouth than snout tip. Hindmost gill opening above pectorals. Spiracles small, behind eyes. First dorsal large. Second dorsal and anal small. Caudal compressed, subcaudal produced. Pectorals falcate.

One species. This shark feeds on fishes schooling at the surface, which it attacks by swimming around in gradually diminishing circles, lashing the water with its long tail. Stories of its attacks on whales or other large marine animals are evidently untrue.

ALOPIAS VULPINUS (Bonnaterre)

Squalus vulpinus BONNATERRE, Tableau encyclop. Ichth., p. 9, pl. 85, fig. 349, 1788 (type locality: Mediterranean).

Alopias vulpinus OGILBY, Mem. Queensland Mus., vol. 5, p. 74, 1916 (Moreton Bay).—MCCULLOCH, Biol. Res. *Endeavour*, vol. 4, pt. 1, p. 170, 1916 (off Cape Everard, Victoria, in 200 fathoms).—WAITE, Rec. South Australian Mus., vol. 2, p. 18, fig. 22, 1921.—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 6, p. 265, fig. 9, 1924 (New Zealand).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 101, 1925 (Misaki, Tokyo, and Osaka markets).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—MCCULLOCH, Fishes New South Wales, ed. 2, p. 8, pl. 2, fig., 1927.—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Chinnampo, Korea).—FOWLER, Mem. Bishop Mus., vol. 10, p. 18, fig. 4, 1928 (Honolulu; Fanning Islands); Hong Kong Nat., vol. 1, p. 87, 1930 (Hongkong); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 488, 1930 (Hawaii; Atlantic).—PHILLIPPS, New Zealand Journ. Sci. Tech., vol. 13, p. 226, 1932 (Nelson, New Zealand).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 43, 1936 (New Jersey; Rhode Island).

Squalus vulpes GMELIN, Syst. Nat. Linn., vol. 1, p. 1496, 1789 (type locality: Mediterranean; Scotland; Cornwall).—WALBAUM, Artedi Pisc., vol. 3, p. 508, 1792 (copied).

Carcharhinus vulpes BLAINVILLE, Bull. Soc. Philom. Paris, 1816, p. 121 (name only).

Alopias vulpes MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 74, pl. 35, fig. 1, 1841 (teeth) (Mediterranean, Atlantic, Cape of Good Hope).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 421, 1865 (Atlantic, Cape of Good Hope).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 393, 1870 (English coast; Cape Seas).—DAY, Fishes of India, Suppl., p. 810, 1888 (Ceylon).—OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1772, 1888 (Port Jackson.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—DAY, Fauna British India, Fishes, vol. 1, p. 28, fig. 9, 1889.—SAUVAGE. Hist. Nat. Madagascar, Poiss., p. 511, 1891 (reference).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 127, 1901 (Tokyo; Nagasaki).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 27, p. 939, 1904 (Honolulu).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), pt. 1, 42, fig. 4, 1905 (Honolulu).—STEAD, Fishes of Australia, p. 232, 1908.—GÜNTHER, Jour. Mus. Godeffroy, pt. 17, p. 483, 1910 (compiled).—ZUGMAYER, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—THOMPSON, Marine Biol. Rep. South Africa, No. 2, p. 147, 1914 (Natal).—W. E. ALLEN, Science, vol. 58, p. 31, 1923 (behavior).

Alopeciens vulpes GUICHENOT, Notes ile Réunion, vol. 2, p. 30, 1862 (error).

Alopecias vulpes HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 78, 1872 (Blind Bay).—RAMSAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 359, 1881 (Port Jackson).—MCCOY, Prodromus Zool. Victoria, vol. 1, dec. 9, pl. 88, 1884 (part).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 43, 1890 (Queenscliff).

Alopias macrourus RAFINESQUE, Caratteri animali piante Sicilia, p. 12, 1810 (type locality: Sicily).

Squalus alopecias GRAY, Cat. Fish Gronow, p. 7, 1854 (type locality: Atlantic; Mediterranean).

Alopecias barrae PHILIPPI, Anal. Univ. Chile, vol. 71 p. 553, pl. 5, fig. 2, 1887 (type locality: Valparaiso, Chile).

Alopecias longimana PHILIPPI, Anal. Univ. Chile, vol. 109, p. 308, 1901 (type locality: Talcahuano Bay, Chile).

Vulpecula marina GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 30, pl. 7, fig. 42, 1913 (type locality: Massachusetts Bay).—TANAKA, Jap. Fish. Life Colours, no. 15, 1933.

?*Alopias profundus* NAKAMURA, Mem. Fac. Sci. Taihoku Imp. Univ., vol. 14, Zool. 4, p. 2, pl. 1, fig. 1, 1935 (type locality: Formosa) (fetus).

?*Alopias pelagicus* NAKAMURA, op. cit., p. 3, pl. 1, fig. 2 (type locality: Formosa) (fetus).

Depth 4 to subcaudal origin; head 4¼, width 1½. Snout 3⅞ in head; eye 7¾, 2 in snout, 4 in interorbital; mouth width 3, length of gape 1⅓ its width; preoral length 3⅔ in head; outer labial fold half gape, inner half length of outer; teeth in 28 to 42 rows, simple, smooth, sharp edged; nostrils small, nearer mouth than snout end; front nasal valve with short lobe near inner edge; interorbital 2⅛ in head, moderately elevated, convex. Gill openings small, last 2 closer below and over pectoral base.

Scales keeled, quindentate.

First dorsal origin above inner pectoral origin, front edge 1⅓ in head; second dorsal length 4⅓; anal length 3¾, inserted behind second dorsal base; front edge of subcaudal 2½ in head; least depth of caudal peduncle 2⅔; ventral length 1⅗; pectoral 3⅙ in body to subcaudal origin; combined head and body to subcaudal origin 1¼ in caudal length.

Dark slaty brown above to level of spiracle, below which contrasted with white of lower surface. Lower sides of pectoral and space below gill openings dark slate-gray.

Arabia, Natal, South Africa, Ceylon, China, Japan, Korea, Queensland, New South Wales, Victoria, Tasmania, South Australia, New Zealand, Polynesia, Hawaii. Also in the Eastern Pacific in California and Chile and in the Atlantic. It reaches 4,575 mm. (15 feet) in length.

1 example. A.N.S.P. Newport, Rhode Island. J. C. Dunn. Length, 1245 mm.

The two following nominal forms are included merely to complete the record:

ALOPIAS CAUDATUS Phillipps

Alopias caudatus PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 13, p. 226, fig. 1, 1932 (on McCoy).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Alopecias vulpes (not Linnaeus) McCOY, Prodr. Zool. Victoria, vol. 1, dec. ix, pl. 88, 1885 (type locality: Hastings, Victoria).

Alopias vulpinus (not Bonnaterre) PHILLIPPS, Bibl. New Zealand Fishes, Fisher. Bull. 1, p. 8, 1927.

The tail approximately equal in length to body as measured to its base. Outer margin of pectoral almost straight. Caudal peduncle deep, sometimes half body depth at dorsal origin. Length, 10 feet 2 inches. (Phillipps.)

North Auckland Peninsula, New Zealand, and Victoria, Australia. Phillipps distinguishes this species chiefly by the long tail, equally as long as the rest of the body.

ALOPIAS GREYI Whitley

Alopias greyi WHITLEY, Rec. Australian Mus., vol. 22, p. 25, 1937 (type locality: Off Bermagui, New South Wales).

Differs in its greenish instead of slaty coloration, and the eyes modified for backward vision, more advanced in *Alopias vulpinus.* Length, 10 feet; tail about half.

Family GALEORHINIDAE

Body elongated. Tail compressed. Head depressed. Snout depressed, rounded to pointed as seen from above. Eyes lateral with nictitating membranes. Mouth inferior, well arched. Nostrils below snout. Spiracle small or obsolete. Two dorsals, spineless; first fin short, elevated, entirely before ventrals; second fin small, opposite anal. Tail mostly bent up from caudal base, sides without keel.

The majority of sharks belong with this family. At least usually one and frequently several members occur on most every temperate or tropical coast of the globe. Many of the species are very closely related, some with great similarity of appearance or the distinguishing characters subtle and hard to define. A few are cosmopolitan, and most all are of generalized sharklike aspect. Both among living and fossil forms, which are known since the early Tertiary, the teeth have usually been used as the basis of classification.

The following may belong in this family, known only from jaws in the Royal College of Surgeons, according to Whitley and at present indeterminable:

Genus GALEOLAMNA Owen

Galeolamna Owen, Cat. Osteol. Roy. Coll. Surg., vol. 1, p. 96, No. 427, 1853. (Type, *Galeolamna greyi* Owen.)

GALEOLAMNA GREYI Owen

Galeolamna greyi Owen, loc. cit. (type locality: South Australia).—Whitley, Rec. Australian Mus., vol. 18, p. 324, 1932; Mem. Queensland Mus., vol. 10, pt. 4, pp. 185, 198, 1934 (reference).

ANALYSIS OF GENERA

a^1. Galeorhininae. Teeth compressed, triangular, a single series functional.
  b^1. Spiracles absent.
    c^1. Teeth with entire edges.
      d^1. Teeth with swollen bases, cusps slender, oblique__________ **Physodon**
      d^2. Teeth without swollen bases.
        e^1. Teeth with oblique cusps in both jaws_________________ **Scoliodon**
        e^2. Teeth with cusps rather slender, upper nearly erect, lower erect. **Aprionodon**
    c^2. Teeth only serrated on bases of those in upper jaw; lower teeth entire. **Hypoprion**
    c^3. Teeth all serrated, at least some or all on bases and cusps.
      f^1. First dorsal near pectorals______________________________ **Eulamia**
      f^2. First dorsal near ventrals_______________________________ **Glyphis**
  b^2. Spiracles minute.
      g^1. Teeth entire, oblique, notched, subequal in jaws______ **Loxodon**
      g^2. Teeth only denticulated in upper jaw; labial folds on both jaws. **Hemigaleus**
      g^3. Teeth serrated in both jaws, large, subequal, oblique; labial fold along upper jaw_________________________________ **Galeocerdo**
  b^3. Spiracles small, oblique; teeth short, serrated, notched, oblique; caudal pits rudimentary; subcaudal short______________________ **Galeorhinus**
  b^4. Spiracle large; teeth triangular, both coronal edges becoming coarsely serrated toward apex_____________________________________ **Hemipristis**

a^2. MUSTELINAE. Teeth in bands or pavement, more than one series functional.
- h^1. Teeth compressed, cusps 3 to 5.
  - i^1. Labial folds present.
    - j^1. No spiracles.
      - k^1. Caudal with pit; subcaudal produced ______ Triaenodon
      - k^2. Caudal without pit; subcaudal rudimentary. Leptocharias
    - j^2. Spiracles present ______ Triakis
  - i^2. No labial folds ______ Eridacnis
- h^2. Teeth in pavement, labial folds long; subcaudal not produced.
  - l^1. Teeth blunt or with cusps rudimentary; no nasoral grooves ______ Mustelus
  - l^2. Teeth with flattened crowns; nasoral grooves present. Scylliogaleus

Genus PHYSODON Müller and Henle

Physodon MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 30, 1841. [Type, *Carcharias* (*Physodon*) *mülleri* (Valenciennes) Müller and Henle, monotypic.]

Body slender, elongate, compressed, cavity nearly half of total. Head long, depressed. Snout long. Eye with nictitating membrane. Mouth greatly arched, with short labial fold. Teeth entire; upper teeth flat, oblique, small in mandible medianly, laterally much larger, swollen at base as with narrow oblique cusp; small median upper teeth and 2 small lower symphyseal. Nostrils about ⅕ length from mouth forward, far apart. Last gill opening above pectoral base. Pit before upper caudal lobe. Fins small. First dorsal nearer ventrals than pectorals. Anal much longer than second dorsal.

India, China, Australia. Though for many years but a single species was admitted, another was described more recently from Australia.

ANALYSIS OF SPECIES

a^1. One upper median tooth, 2 lower ones ______ mülleri
a^2. One upper median tooth, none below ______ taylori

PHYSODON MÜLLERI (Müller and Henle)

Carcharias (*Physodon*) *mülleri* (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 30, pl. 19, fig. 1, 1841 (teeth) (type locality: Bengal).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 347, 1865 (type).

Carcharias mülleri GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 360, 1870 (compiled).—DAY, Fishes of India, pt. 4, p. 713, 1878 (Bengal).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 351, 1881 (Cape York).—DAY, Fauna British India, Fishes, vol. 1, p. 11, 1889 (Bengal).—ZUGMAYER, Abh. Kon. Bayer. Akad. Wiss. math.-phys. Kl., vol. 26, p. 8 (Mekran), p. 17 (Pasui), 1913.

Carcharias muelleri OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1767, 1888 (Cape York).

Squalus (*Triglochis*) *mülleri* Gray, List fish British Museum, p. 42, 1851 (reference).

Physodon mülleri Garman, Mem. Mus. Comp. Zool., vol. 36, p. 108, 1913 (China).—Ogilby, Mem. Queensland Mus., vol. 5, p. 79, 1916 (Cape York specimen).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, p. 128, 1925 (reference).—Fowler, Hong Kong Nat., vol. 1, p. 85, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Elongate, slender, body cavity nearly half total length; head broader than deep. Snout long, broad, pointed, 3 in head to first gill opening; eye small, lateral, above middle of mouth; mouth greatly arched, little wider than long, short labial fold in angle and on lower jaw; teeth in 27 rows above, 28 below, edges smooth, 1 median upper and 2 median lower; cusps of forward teeth long, sharp, like *Isurus* in outline, with wide base and swollen and with deep notch behind cusp; nostrils about ⅕ of preoral, far apart. Gill openings wider than eye, equal, last above pectoral edge.

Scales very small, with 3 strong keels, each ending in sharp point.

First dorsal origin midway between bases of paired fins, base not reaching ventral origin, hind angle acute, above middle of ventral; second dorsal very small, base less ⅓ of either first dorsal or anal, reaches farther back than that of anal, hind angle acuminate; anal base distant its length from caudal or ventral bases; caudal moderate, subcaudal medium; pectorals subtruncate, inner angle about 90°; terminal end of clasper with 4 blades, third smaller, short, rounded, the edge toothed.

Back brownish, below whitish. Fins darker, except on edges. Length, 420 mm. (Garman.)

India, China, North Australia, Queensland. The type in the Paris Museum according to Duméril is 500 mm. long.

PHYSODON TAYLORI Ogilby

Physodon taylori Ogilby, Mem. Queensland Mus., vol. 3, p. 117, 1915 (type locality: Townsville, Queensland); vol. 5, p. 79, 1916 (type).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 494, 1930 (reference).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Body moderately slender, compressed, upper profile convex to first dorsal and vent slightly premedian; head 6$\frac{1}{10}$ in total. Snout rather short, obtusely pointed, depressed; eye vertically elliptical, $\frac{3}{10}$ nearer mouth than nostril, midway between snout tip and first gill slit, 4⅙ in preoral length or 3⅘ in mouth width; preoral length 1⅓ ramal length of upper jaw, little more than mouth width and $\frac{1}{10}$ less space between eye and first gill opening; angle of upper jaw opposite anterior eye edge and groove behind mouth angle; labial folds moderate, lower twice long as upper which $\frac{1}{4}$ ramal length; teeth rather stout, moderately oblique, upper with tip straight, lower with tip bent somewhat inward, each with deep notch behind; upper median unpaired tooth, no lower one; nostril width little less than eye, 2 small triangular valvules, outer larger, near inner anterior nasal angle; internarial half space between snout tip and nostril, $1\frac{1}{5}$ between nostril and mouth angle, $1\frac{1}{2}$ between outer and nasal angles; interorbital $\frac{1}{10}$ more than preoral length. Gill openings narrow, last 2 above pectoral.

First dorsal origin little behind inner pectoral angle, inner lobe not quite reaching opposite ventral origin; second dorsal base $4\frac{1}{5}$ in first dorsal base; anal ends below middle and $1\frac{9}{10}$ in second dorsal base; pectoral triangular, outer and inner angles obtuse, width $1\frac{1}{4}$ its length and $1\frac{1}{10}$ in first dorsal base, outer angle reaching anterior third of first dorsal; caudal 4 in total, subcaudal $1\frac{1}{3}$ in caudal.

Dark blue-gray above, lighter below. Fins without darker tips or borders. A half-grown female. (Ogilby.)

Queensland.

Genus SCOLIODON Müller and Henle

Scoliodon Müller and Henle, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 114. [Atypic. Type, *Carcharias* (*Scoliodon*) *laticaudus* Müller and Henle; Arch. Naturg., 1837, p. 397; Syst. Beschr. Plagiostomen, p. 27, 1841. Type designated by Gill, Ann. Lyceum Nat. Hist. New York, vol. 8, p. 35, 1861.]

Alopiopsis Lioy, Atti Soc. Ital. Sci. Nat. Milano, vol. 8, p. 398, 1865. (Type, *Alopiopsis plejodon* Lioy, monotypic.) (Fossil.)

Rhizoprion (not Jourdain, 1861) Ogilby, Mem. Queensland Mus., vol. 3, p. 132, 1915. (Type, *Carcharias* (*Scoliodon*) *crenidens* Klunzinger, orthotypic.)

Rhizoprionodon Whitley, Australian Zoologist, vol. 5, p. 354, 1929. (Type, *Carcharias* (*Scoliodon*) *crenidens* Klunzinger, orthotypic. *Rhizoprionodon* Whitley proposed to replace *Rhizoprion* Ogilby.)

Body compressed. Head depressed. Snout elongate, end blunt. Eye with well developed nictitating membranes. Mouth inferior, greatly arched, with short labial folds at angles. Teeth alike in two jaws, sectorial, more or less smooth on edges, bases broad, with triangular cusp inclined over notch above base on outer edge; median upper tooth and two symphyseal lower teeth, smaller sometimes. Scales minute, with 3 to 5 keels. Subcaudal lobe prominent. Caudal pits distinct.

Temperate and tropical seas. Distinguished from *Eulamia* chiefly by the entire teeth at all ages. Fossils are known from the Lower Tertiary and later.

ANALYSIS OF SPECIES

a^1. Rhizoprionodon. Anal base length not more than twice second dorsal base.
  b^1. First dorsal higher than long; short labial folds only at mouth angles.
    c^1. Eye nearly midway between snout tip and pectoral; anal base ⅓ in space to ventrals; anal wholly before second dorsal________________ dumerilii
    c^2. Eye midway between snout tip and second gill opening; anal wholly before second dorsal________________ jordani
  b^2. First dorsal longer than high.
    d^1. Depressed pectoral reaches beyond first dorsal origin; labial folds moderate or well developed.
      e^1. Labial folds elongate, nearly subequal, on both jaws______ vagatus
      e^2. Labial folds moderate, less than ⅓ of jaws, present on both jaws though lower little shorter.
        f^1. Pectoral reaches about ¼ in first dorsal base, hind inner angle opposite first dorsal origin________________ walbeehmii
        f^2. Pectoral reaches middle of dorsal base, hind inner angle little behind first dorsal origin________________ intermedius
    d^2. Depressed pectoral reaches only opposite first dorsal origin; labial folds short________________ palasorrah
a^2. Scoliodon. Anal base length more than twice second dorsal base length. sorrakowah

Subgenus Rhizoprionodon Whitley

SCOLIODON DUMERILII (Bleeker)

Carcharias (*Scoliodon*) *dumerilii* Bleeker, Act. Soc. Sci. Indo-Néerl., vol. 1, No. 5, p. (8), 70, 1856 (type locality: Amboina); vol. 2, No. 7, p. 9, 1857 (Amboina).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 344, 1865 (compiled).—Bleeker, Act. Soc. Sci. Indo-Néerl. (Batavia), vol. 8, p. 9, 1869 (Celebes).

Carcharias (*Scoliodon*) *dumerili* Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 115, 1874 (Chinese drawing).—Weber, *Siboga* Exped., Fische, vol. 57, p. 589, 1913 (Makassar).

Carcharias dumerilii Günther, Cat. Fishes British Mus., vol. 8, p. 359, 1870 (type); *in* Brenchley, Cruise *Curacoa*, p. 410, 1873 (Celebes).—Lunel, Mem. Soc. Phys. Hist. Nat., 1881, p. 282 (Misol).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 1, 1888 (New Hebrides).

Scoliodon dumérilii Garman, Mem. Mus. Comp. Zool., vol. 36, p. 111, 1913 (Amboina).—Fowler, Hong Kong Nat., vol. 1, p. 84, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 494, 1930 (reference); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 11, 1934 (Dumaguete).—Fowler, Mem. Bishop Mus., vol. 11, No. 6, p. 385, 1934 (New Hebrides).

Scoliodon dumerili Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 13, 1937 (reference).

Depth 11 in total length; head 6½, much broader than deep. Snout twice mouth length; eye 3 times in preoral, pupil vertical oval; preoral twice mouth length; labial folds short, in mouth angles; teeth entire, oblique, curved; small, erect, median upper tooth; nostrils midway between snout tip and mouth angles, each with prominent triangular valve. Last gill opening above pectoral.

Lateral line distinct.

First dorsal inserted little nearer pectoral than ventral, base less than height, emarginate, apex acute, little rounded, posteriorly acute; second dorsal 4 times base length from first dorsal, twice shorter than anal, entirely behind anal, little emarginate, acute behind; anal less twice low as base length, emarginate, obtusely rounded in front, posteriorly acute; caudal 3¼ to 3⅓ in body; pectoral longer than wide, emarginate, ends rounded; ventral obliquely quadrate, more than 3 times shorter than pectoral, little or not emarginate, angles rounded.

Above olive-coppery, below white. Fins blue-gray, except angle of first dorsal, which strongly margined black. Pectorals terminally and posteriorly and ventrals with all edges whitish. Length, 553 mm. (Bleeker.)

East Indies, China.

SCOLIODON JORDANI Ogilby

Scoliodon jordani Ogilby, Proc. Roy. Soc. Queensland, vol. 21, p. 88, 1908 (type locality: Outer Caloundra Bank in 25 fathoms, South Queensland); Mem. Queensland Mus., vol. 5, p. 79, 1916 (type accidentally destroyed).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, p. 128, 1925 (reference).—Fowler, Proc. 4th (1929) Pac. Sci. Congress, Java, p. 494, 1930 (compiled).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 186, fig. 213 (type lost; types of *Scoliodon affinis* and *S. longmani;* Burnett River; Moreton Bay), p. 199 (reference), 1934.

Carcharias acutus (not Rüppell) Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 1, 1888; Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1766, 1889 (Burnett River, Queensland).

Scoliodon affinis Ogilby, Mem. Queensland Mus., vol. 1, p. 29, 1912 (type locality: Noosa Head, Queensland); vol. 5, p. 79, 1916 (type).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 494, 1930 (compiled).

Scoliodon longmani Ogilby, Mem. Queensland Mus., vol. 1, p. 30, 1912 (type locality: Moreton Bay); vol. 5, p. 80, 1916 (type).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925, (reference).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 494, 1930 (compiled).

Depth 10⅗ in total; head 5, width 2¼. Snout 2⁴⁄₉ in head, produced, pointed; eye 8, little nearer first gill opening than snout tip; mouth width 3⅜ in head, ⁵⁄₇ snout length, ⅙ more than mouth length, mandible tip rounded, not extending forward to front eye edge; outer labial groove very short, directed outwards at right angle to jaw and ⅑ of space between eye and mouth, no inner groove; internarial 1⅒ in mouth width, space between outer nasal angles little more than between inner mouth angle and snout tip. Gill openings narrow, fourth widest though less than eye.

First dorsal inserted nearer ventral than pectoral, front edge undulose, outer angle rather sharply rounded, hind angle not quite reaching ventral origin, base 1⅕ fin height; second dorsal very small, inserted much nearer tail tip than first dorsal origin, base length 3⅕ of first dorsal; anal inserted much nearer caudal than ventral or wholly before second dorsal, hind edge much shorter than that of second dorsal and little less than basal length, which 2⅖ in space to caudal pit; caudal 1⅒ in head, 4½ in total, subcaudal 2⅙ in caudal length to notch; pectoral reaches below first dorsal origin, front edge linear, lower angle rounded, width ⅘ its length; ventral rather small, angles obtusely rounded.

Dark ashy blue above, gray beneath. Iris white. Paired fins outwardly edged ash gray. Length, 860 mm. (Ogilby.)

Queensland.

SCOLIODON VAGATUS Garman

Scoliodon vagatus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 116, 1913 (type locality: Zanzibar).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 190 (Delagoa Bay).

Carcharinus vagatus Barnard, Ann. South African Mus., vol. 21, pt. 2, p. 1012, 1927 (compiled).

Depth 5½ to subcaudal origin; head 3¾. Snout 2⅙ in head; eye 7, 3 in snout in profile; mouth length 1¼ its width, short labial folds on both jaws, upper little longer or ⅔ of eye, reaches ⅔ to hind eye edge in profile; teeth in 25 rows above, 23 rows below, bases broad, cusps rather narrow, short, inner or cutting edges well inclined toward mouth angles and all edges entire; upper teeth with slightly wider cusps.

Scales minute, tridentate, with 3 keels.

First dorsal origin slightly behind pectoral base, well before inner pectoral angle, slightly longer than high, hind edge deeply emarginate and ends behind in sharp, slender point, nearly opposite ventral origin; second dorsal base slightly over half of anal base, hind angle ends in slender point, base ⅔ its distance from caudal, insertion little before anal origin; anal third again large as second dorsal, base half space to ventral origin; caudal 3½ in total length, slender, subcaudal ⅔ of upper lobe, pits well developed; pectoral reaches ⅓ in first dorsal base, width 1⅚ length, hind edge concave; ventral small, rounded externally, hind lobe moderate.

Back mauve-gray. First dorsal with black edge and tail deeper at point.

Zanzibar, Portuguese East Africa. The type in the Museum of Comparative Zoology is 773 mm. long.

1 example. A.N.S.P. Delagoa Bay. H. W. Bell Marley. Length, 355 mm.

SCOLIODON WALBEEHMII (Bleeker)

Carcharias (*Scoliodon*) *walbeehmii* Bleeker, Nat. Tijds. Nederland. Indië, vol. 10, p. (348) 353, 1856 (type locality; Rio, Bintang Island).

Carcharias (*Scoliodon*) *walbeehmi* Bleeker, Nat. Tijds. Nederland. Indië, vol. 13, p. 284 (Tjirutjup, Billiton), p. 389 (Timor koepang), 1857.—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 344, 1865 (compiled).—Bleeker, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).

Carcharias walbeehmii Günther, Cat. Fishes British Mus., vol. 8, p. 359, 1870 (type; Japan).—Day, Fishes of India, pt. 4, p. 712, pl. 185, fig. 2, 1878 (Malabar).—Meyer, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 48, 1885 (Macassar, South Celebes).

Carcharias walbeehmi Day, Fauna British India, Fishes, vol. 1, p. 10, 1889 (India, Malay Archipelago, Japan).—Bartlett, Sarawak Gazette, vol. 26, No. 366, p. 133, 1896 (Baram and Moratabus).—Southwell, Ceylon Administr. Rep., 1912–13, p. E49.

Carcharias walbchmii Pearson, Ceylon Administr. Rep., 1915–18, p. F8.—Tirant, Service Océanogr. Pêches Indo-Chine, 6^e note, p. 60, 1929 (Cochin-china).

Carcharias walbeemi Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 350, 1929 (Travancore).

Scoliodon walbeehmi Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 39 (127), 1901 (Nagasaki).—Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 318, 1902 (Formosa).—Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 161, pl. 63, fig. 2, 1909 (Takao).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 112, 1913 (Singapore, Columbo, Pinang).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1918, p. 2 (Philippines); Copeia, No. 58, p. 62, 1918 (Philippines); Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 256, 1927 (Philippines; Orion).—Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, no. 4, p. 6, fig. 4, 1929 (Amoy).—Fowler, Hong Kong Nat., vol. 1, p. 84, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 494, 1930 (Philippines; Formosa).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 236, fig. 10, 1932 (Chefoo).—Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 94, 1933 (Ningpo; Wenchow).—Tanaka, Jap. Fish. Life Colours, No. 23, 1933.—Herre, Fishes Herre Philippine Exped. 1931, p. 11, 1934 (Manila; Dumaguete).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 406, fig. 1, 1934 (Natal); vol. 87, p. 89, figs. 4–5, 1935 (Bangkok); vol. 89, p. 128, 1937 (Bangkok).—Suvatti, Index Fish. Siam, p. 3, 1937 (Maenam Phatalung).

Scoliodon walbechmii Jordan and Richardson, Bull. Bur. Fisher., vol. 27 (1907) p. 235, 1908 (Manila).—Hora, Mem. Asiatic Soc. Bengal, vol. 6, p. 464, 1924 (Tale Sap. Peninsular Siam).—Herre, Journ. Pan-Pac. Res. Inst., vol. 8, no. 4, p. 6, 1933 (Dumaguete).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 13, 1937 (reference).—Fowler, List Fish. Malaya, p. 11, 1938 (reference).

Carcharinus walbeehmi Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 24, pl. 1, fig. 2, 1925 (Natal coast).

Depth 7 to 7¼ to subcaudal origin; head 4 to 4½, width 1⅔ to 1⅞. Snout 2⅛ to 2¼ in head, as seen from above nearly triangular or somewhat pointed; eye 5⅓ to 10⅕, 3 to 4¾ in snout, 3 to 4⅘ in interorbital, orbit depth 1⅕ to 1¼ its length; dentary width 3 to 3⅛ in head, length 1⅖ to 1¾ in its width; deep groove at mouth angle with longer one above about long as eye and deeper shorter one on lower jaw; teeth 26 to 28 rows in jaws, entire, upper little broader, triangular, directed towards mouth sides, outer edge of each notched, lower narrower, also inclined laterally; nostrils about last ⅖ in preoral length, aperture width 3⅗ in internarial, front valve with short narrow triangular papilla; interorbital 2 to 2½ in head, broad, slightly convex. Gill openings equidistant, last 2 above pectoral origin.

Scales minute, lobate, ends in point behind, with 6 to 10 marginal denticles.

First dorsal inserted opposite inner hind angles of depressed pectorals, front edge 1⅗ to 1¾ in head; second dorsal inserted nearly opposite hind basal end of anal, front edge 5½ to 6 in head; anal origin nearer that of subcaudal than ventral, front edge 4 to 4⅗ in head; subcaudal with front edge 2, or 2 in its own length; least depth of caudal peduncle 5⅗ to 6⅞ in head; pectoral 1½ to 1¾, width 1¾ its length; ventral 2⅞ to 3 in head.

Gray above, under surfaces paler or whitish.

Natal, India, Ceylon, Singapore, Pinang, East Indies, Philippines, Indochina, China, Formosa, Japan. This species seems to be well figured by Day, though this is apparently overlooked or ignored by Garman. Day says, "A well marked groove at the angle of the mouth extending on to both the upper jaw and along a portion of the mandible." His figure shows this and agrees with my materials. Garman says "labial folds short, extended more on the lower jaws than on the upper." His *Scoliodon intermedius* seems to differ in that the "labial fold on upper jaw about two sevenths of its length, that on lower jaw little shorter, partly hidden at angle." His distinction for *Scoliodon walbeehmi* that the "distance between outer angles of nostrils and between them and end of snout about equal" and for *Scoliodon intermedius* "snout rounded, length from nostrils little less than the distance between their outer angles" is a variable condition. Though my specimens all show the condition for *Scoliodon intermedius*, Day's figure shows these proportions equal.

7930. Limbones Cove. February 8, 1909. Length, 580 mm.
4529. Manila market. December 12, 1907. Length, 330 mm.
5249. Manila market. March 20, 1908. Length, 465 mm.
6313. Manila market. June 25, 1908. Length, 512 mm.
4553. Manila, Santa Cruz market. January 4, 1907. Length, 345 mm.
7910. Off Langao Point. February 7, 1909. Length, 750 mm.
7907. Off Muya Island. February 7, 1909. Length, 700 mm.
5007. South Tomindao. February 26, 1908. Length, 723 mm.
5085. Sandakan, Borneo. March 2, 1908. Length, 364 mm.

SCOLIODON INTERMEDIUS Garman

Scoliodon intermedius GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 115, 1913 (type locality: Philippines; East Indies).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 494, 1930 (reference).—HERRE, Fishes Herre Philippine Exped. 1931, p. 11, 1934 (Capiz; Unisan; Sitanki).—SUVATTI, Index Fish. Siam, p. 2, 1937 (Sriracha).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 13, 1937 (reference).

Body compressed; head elongate, depressed. Snout moderately broad, rather long, narrow, twice long as mouth; eye medium, diameter greater than width of gill openings, twice mouth length;

mouth somewhat pointed arch, upper labial fold 2/7 jaw length, lower little shorter and partly hidden at angle; teeth in 25 rows above, 26 rows below, deeply notched on hind edge, broad based, cusps inclined outward, concave on inner edge; upper median and 2 lower symphyseal teeth more erect and smaller than others; outer nasal angles nearer to snout end than mouth angles. Gill openings rather narrow, last 2 above pectoral.

Scales minute, 5 keels produced as short spines.

First dorsal base 2½ times its length before second dorsal, hind angle reaches opposite ventral origin; second dorsal very small, acuminate end extended more than halfway from its base to caudal pit; anal base nearly twice second dorsal base, ends below middle of latter, hind edge deeply excavated; caudal less ⅓ of total, subcaudal prominent, pits distinct; pectoral reaches middle of first dorsal base, hind edge concave, inner angle extends little behind vertical from first dorsal origin; ventral equals anal, inner angles much less produced.

Back brown, shading white below from flanks and sides of head. Hind pectoral edges white. Length, 480 mm. (Garman.)

East Indies, Philippines. Probably not distinct from *Scoliodon walbeehmii.*

SCOLIODON PALASORRAH (Cuvier)

Carcharias palasorrah Cuvier, Règne Animal, ed. 2, vol. 2, p. 388, 1829 (on *Palasorrah* Russell, Fishes of Coromandel, vol. 1, p. 9, pl. 14, 1803, type locality: Vizagapatam; Madras).

Carcharias palasorra Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 9, 1853 (reference).

Carcharias (*Prionodon*) *palasorra* Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 9, 1853 (reference).

Scoliodon palasorrah Garman, Mem. Mus. Comp. Zool., vol. 36, p. 111, 1913 (India, East Indies).—Fowler, Mem. Bishop Mus., vol. 10, p. 22, 1928 (compiled); Hong Kong Nat., vol. 1, p. 83, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 494, 1930 (East Indies); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (references).—Chevey, Inst. Océanogr. Indochine, 19^{e} note, p. 5, 1932 (Cochinchina).—Herre, Journ. Pan.-Pac. Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 11, 1934 (Dumaguete).—Tortonese, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, No. 63, p. 8, 1935–36 (Massaua, Mar Rosso).—Suvatti, Index Fish. Siam, p. 2, 1937 (Samut Prakan; Laem Sing; Maeklong).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 13, 1937 (reference).—Fowler, List Fish. Malaya, p. 11, 1938 (reference).

Carcharias acutus Rüppell, Neue Wirbelth., Fische, p. 65, pl. 18, fig. 4, 1835 (type locality: Djedda, Red Sea).—Schmeltz, Cat. Mus. Godeffroy, No. 2, p. 10, 1865 (South Seas).—Günther, Cat. Fishes British Mus., vol. 8, p. 358, 1870 (Cape of Good Hope, East Indies, Pinang, Singapore, Vizagapatam, Japan).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 655, 1871 (Koseir, Red Sea).—Day, Fishes of India, pt. 4, p. 712, pl. 188, fig. 2, 1878 (Madras).—Károli, Termez. Füzetek, Budapest, vol. 5, p. 148, 1881 (Sarangoon;

Palaboen, Java).—BOULENGER, Proc. Zool. Soc. London, 1885, p. 135 (Muscat).—OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1766, 1888 (Burnett River; Madras); Cat. Fishes Australian Mus., pt. 1, p. 1, 1888 (Burnett River, Queensland; Madras).—BRUSINA, Glasnik Naravosl. Družtva, vol. 3, p. 223, 1888 (Red Sea).—DAY, Fauna British India, vol. 1, p. 10, 1889 (Red Sea, India, Malay Archipelago).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—ELERA, Cat. Fauna Filip., vol. 1, p. 613, 1895 (Luzon, Manila).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 237, 1907 (Sumatra).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E42-E44, E 49.—ZUGMAYER, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8 (Mekran and Oman), p. 16, 1913.—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—TIRANT, Service Océanogr. Peches Indo-Chine, 6^e note, p. 60, 1929 (Cochinchina).

Carcharias (*Scoliodon*) *acutus* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 29, 1841 (Red Sea, India, Java).—RICHARDSON, Ichth. China Japan, p. 194, 1846 (Canton, China Seas).—CANTOR, Journ. Asiat. Soc. Bengal, vol. 18, p. 1381, 1849 (Pinang, Singapore, Malay Peninsula).—BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 2, p. 473, 1851 (Rio); vol. 3, p. 446, 1852 (Banka); Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 30, 1852 (Batavia); (Bengal), vol. 25, p. 80, 1853 (reference); Nat. Tijds. Nederland Indie, vol. 15, p. 243, 1858 (Singapore); vol. 16, p. 409, 1858 (Jafara, Java); vol. 21, p. 136, 1860 (Muntok, Java).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 345, 1865 (Seas of the Indies, China; not Brazil, Guadeloupe, and Martinique specimens).—BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 276 (Batjan), p. 290 (Rio, Bintang), 1868.—PETERS, Monatsb. Akad. Wiss. Berlin, 1868, p. 281 (Singapore).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Formosa Strait, Bangkok, Singapore, Sunda Strait, Batjan).—STEINDACHNER, Ann. Hofmus. Wien, vol. 11, p. 227, 1896 (Bangkok).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 588, 1913 (Makassar).

Squalus (*Scoliodon*) *acutus* GRAY, List fish British Museum, p. 41, 1851 (China and Bengal).

Scoliodon acutus KNER, Reise *Novara* Fische, p. 414, 1865 (Ceylon).—DAY, Fishes of Malabar, p. 268, 1865.—BARTLETT, Sarawak Gazette, vol. 26, no. 366, p. 133, 1896 (Santubong).—JORDAN and SNYDER, Annot. Zool, Japon., vol. 3, p. 39, 1901 ("Japan").—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 458 (Baram, Borneo).—JORDAN and SEALE, Proc. Davenport Acad. Sci., vol. 10, p. 1, 1905; Bull. Bur. Fisher., vol. 26, p. 3, 1907 (Cavite).—OGILBY, Mem. Queensland Mus., vol. 5, p. 79, 1916 (Queensland coast south to Burnett River Heads).—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 31, p. 2, 1926 (Bombay; Baram example); vol. 32, p. 253, 1927 (Bombay).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 13, 1937 (reference).

Carcharinus (*Scoliodon*) *acutus* BLEEKER, Nederland. Tijdschr. Dierk., vol. 2, p. 172, 1865 (Siam).

Charcharinus acutus JORDAN and STARKS, Ann. Carnegie Mus., vol. 2, p. 430, 1917 (Ceylon). (Error.)

Carcharias (*Scoliodon*) *crenidens* KLUNZINGER, Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, pt. 1, p. 426, pl. 8, fig. 3, 1880 (teeth) (type locality: Queensland).—OGILBY, Proc. Linn. Soc. New South Wales, vol. 10, p. 464, 1885 (Burnett River Heads, Queensland); Mem. Queensland Mus., vol. 3, p. 132, 1915 (off Cape Byron).

Carcharias crenidens MACLEAY, Proc. Linn. Soc. New South Wales, vol. 9, p. 62, 1884 (Queensland; on Klunzinger).—OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1767, 1888 (note).

Rhizoprion crenidens Ogilby, Commerc. Fish. Fisher. Queensland, p. 45, 1915 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 80, 1916 (Moreton Bay, Cape Moreton, Double Island Point, Rock Island Reef).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—McCulloch, Fishes of New South Wales, ed. 2, p. 5, 1927.

Eulamia crenidens Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 491, 1930 (compiled).

Rhizoprionodon crenidens Whitley, Australian Zoologist, vol. 5, p. 354, 1929 (reference); Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Carcharias albomarginatus (not Rüppell) (Ehrenberg) Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 655, 1871 (name in synonymy).

Carcharias acronis (Ehrenberg) Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 655, 1871 (name in synonymy).

Carcharias aaronis Hilgendorf, Symbol. Physic. Hemprich Ehrenberg, p. 8, pl. 5, figs. 1, a–c, 1899 (type locality: Red Sea). (Error.)

Scoliodon lalandei (not Müller and Henle) Chabanaud, Service Océanogr. Pêches. Indo-Chine, 1^e note, p. 5, 1926 (Gulf of Siam; Tonkin).

Depth 5 to 7 to subcaudal origin; head 3⅘ to 4⅓, width 1⅔ to 2⅕. Snout 2 to 2⅓ in head; eye 8¾ to 9, 4 to 4⅔ in snout, 3¾ to 4½ in interorbital; mouth width 3 to 3½ in head, length 2⅔ to 3⅕. each angle with short groove along upper jaw; teeth in 25 or 26 rows in jaws, oblique, slender, entire, upper with notch on outer edge, lower little more slender; nostrils little nearer mouth than snout tip, internarial 1⅘ to 2 in preoral length, which 2⅕ to 2¼ in head; interorbital 1⅔ to 2½, broad, convex. Gill openings equidistant, last 2 above pectoral.

Scales minute, end in 3 or 4 points, with as many keels.

First dorsal base nearer ventral than pectoral or behind inner hind pectoral angle, front fin edge 1½ to 1⅔ in head; second dorsal origin above middle or hind end of anal base, length 2¼ to 2¾ in head; anal length 2 to 2¼; least depth of caudal peduncle 4⅘ to 6½; pectoral 1½ to 1⅔, width 1⅔ to 2 in its length; ventral length 2 to 2½ in head; caudal 2⅗ to 3⅕ in rest of body, subcaudal 1⅘ to 2 in caudal length.

Gray brown above, belly and below whitish. Paired fins pale below.

Red Sea, Arabia, South Africa, India, Ceylon, Pinang, Singapore, East Indies, Philippines, Siam, Indo China, China, Japan, Queensland. In the Queensland Museum 2 examples, 467 to 540 mm.; I.3958, Pellew Group, W. E. J. Paradice.

7910. Off Langao Point. February 7, 1909. Length, 750 mm.

7930. Limbones Cove. February 1909. Length, 580 mm.

U.S.N.M. No. 40029. Queensland. Australian Museum. Length, 340 mm.

U.S.N.M. No. 47603. Red Sea. L. M. McCormick. Length, 620 mm.

1 example. A.N.S.P. Baram, Borneo. Dr. Wm. H. Furness, Length, 416 mm.

2 examples. A.N.S.P. Off Bombay, India. Prof. F. Hallberg. Length, 177 and 198 mm.

Subgenus SCOLIODON Müller and Henle

SCOLIODON SORRAKOWAH (Cuvier)

Carcharias sorrakowah CUVIER, Règne Animal, ed. 2, vol. 2, p. 388, 1829 (on *Sorrah kowah* Russell, Fishes of Coromandel, vol. 1, p. 9, pl. 15, 1803, type locality: Vizagapatam).

Carcharias (*Prionodon*) *sorrah-kowah* BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).

Scoliodon sorrakowah GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 110, 1913 (Singapore).—CHABANAUD, Bull. Econom. Indo-Chine, vol. 6, p. 563, 1924 (Gulf of Siam).—FOWLER, Hong Kong Nat., vol. 1, p. 84, 1930 (China, Amoy); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 494, 1930 (Malacca).—CHEVEY, Inst. Océanogr. Indochine, 19e note, p. 5, 1932 (Cochinchina; Cambodge).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 89, 1935 (Bangkok).—SUVATTI, Index Fish. Siam, p. 2, 1937 (Gulf of Siam; Nakon Srithamarat; Maanam Cau Phaya).—FOWLER, List Fish. Malaya, p. 10, 1938 (reference).

Scoliodon sarrakowah CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1e note, p. 5, 1926 (Gulf of Siam).

Carcharias (*Scoliodon*) *laticaudus* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 28, pl. 8, 1841 (type locality: India).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 343, 1865 (type).

Carcharias laticaudus GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 358, 1870 (Bengal, type of *Carcharias macrorhynchos*, China, Amoy, Japan).—DAY, Fishes of India, pt. 4, p. 712, pl. 188, fig. 1, 1878 (India, Malay Archipelago).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 1, 1888 (Bombay).—DAY, Fauna Brit. India, vol. 1, p. 9, fig. 1, 1889.—ELERA, Cat. Fauna Filip., vol. 1, p. 613, 1895 (Luzon, Cavite, Santa Cruz).—BARTLETT, Sarawak Gazette, vol. 26, no. 366, p. 133, 1896 (Buntal and Moratabas).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 236, 1907 (Sumatra?).—PEARSON, Ceylon Administr. Rep., 1912–13, p. E6.—ZUGMAYER, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran).—PEARSON, Ceylon Administr. Rep., 1915–1918, pp. F9, F10.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6e note, pp. 32, 60, 175, 1929 (Hué; Cochinchina).

Carcharias laticaudatus LLOYD, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 350, 1929 (Travancore).

Squalus (*Scoliodon*) *laticaudus* GRAY, List fish British Mus., p. 41, 1851 (reference).—BLYTH, Journ. Asiat. Soc. Bengal, vol. 29, p. 35, 1860 (Calcutta).

Scoliodon laticaudus KNER, Reise *Novara*, Fische, p. 414, 1865 (Madras).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 39, 1901 ("Japan").—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, p. 66, 1908 (Malacca specimen).—EVERMANN and SHAW, Proc. California Acad. Sci., ser. 4, vol. 16, p. 98, 1927 (Wenchow).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 92, fig. 2, 1933 (Yenting).

Carcharias (*Scoliodon*) *macrorhynchos* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, pp. 27, 31, pl., fig. 1, 1852 (head and teeth) (type locality: Batavia); Nat. Tijds. Nederland. Indië, vol. 15, p. 243, 1858 (Singapore).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 343, 1865 (drawing by Bleeker).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 589, 1913 (Makassar).

Carcharias (*Scoliodon*) *macrorhynchus* BLEEKER, Nat. Tijds. Nederland. Indië, vol. 16, p. 435, 1858 (Pamangkat).

Cynocephalus (*Scoliodon*) *macrorhynchus* BLEEKER, Verh. Akad. Wet. Amsterdam, vol. 18, p. 2, 1879 (China).

Depth 7 to subcaudal origin; head 3½, width 2. Snout 1⅞ in head, broad, depressed, flattened, as seen above rather attenuated with rounded end; eye 8 in head, 5 in snout, 4 in interorbital; mouth width 3⅖, gape length about 9/10 mouth width, lower labial fold very short, no upper labial fold; upper teeth 22 rows, lower 23, cusps directed obliquely outward, entire; nostrils last fourth in snout, about ⅔ of eye, internarial 3 in head; interorbital 2¼, slightly and broadly convex. Second and third gill openings largest, last above pectoral base. Scales tridentate, median cusp longest and largest.

First dorsal origin close behind end of depressed pectoral, front fin edge 1 9/10 in head; second dorsal origin over last fourth of anal base, fin length 3 in head; anal length 2⅛; caudal 2¾ in rest of body, front subcaudal edge 2¾ in caudal length; least depth of caudal peduncle 4½ in head; pectoral length 2, width 1¼ in its length; ventral length 3 in head.

Back and upper surfaces dull naples yellow, with slight gray tinge, lower surfaces cream color. Iris pale brown, eyeball shining white. Fins all dull brownish, little deeper medially.

Mekran, India, Ceylon, Malacca, Singapore, East Indies, Philippines, Indo-China, China, Japan.

A.N.S.P. No. 517. Straits of Malacca. Length, 186 mm.

Genus APRIONODON Gill

Aprionodon GILL, Ann. Lyceum Nat. Hist. New York, vol. 7, pp. 400, 401, 411, 1862. (Type, *Carcharias* (*Aprion*) *isodon* Müller and Henle, orthotypic.)
Aprion (not Valenciennes, 1830) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 31, 1841. (Type, *Carcharias* (*Aprionodon*) *brevipinna* Müller and Henle.)

Differs from *Eulamia* chiefly in its dentition, the teeth compressed, edges entire and cusps narrow and nearly erect, bases broad.

Tropical and temperate seas. Fossils known also from lower Tertiary formations.

ANALYSIS OF SPECIES

a^1. Snout short, wide; first dorsal little back of inner pectoral origin; second dorsal larger than anal, origin little farther forward; second dorsal larger than anal, origin little advanced................................ acutidens
a^2. Snout elongate, tapering; first dorsal origin above inner pectoral origin; second dorsal smaller than anal, origin farther back.......... brevipinna

APRIONODON ACUTIDENS (Rüppell)

Carcharias acutidens RÜPPELL, Neue Wirbelth., Fische, p. 65, pl. 18, fig. 3, 1835 (type locality: Djedda, Red Sea).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 361, 1870 (Seychelles).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 657, 1871 (Koseir, Red Sea).—DAY, Fishes of India, pt. 4, p. 713, pl.

189, fig. 1, 1878 (Red Sea, Sind, Indian Ocean).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 350, 1881 (Torres Strait).—Brusina, Glasnik Naravosl. Družtva. vol. 3, p. 233, 1888 (Red Sea).—Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1767, 1888 (Torres Strait).—Day, Fauna British India, Fishes, vol. 1, p. 11, 1889.—Boulenger, Proc. Zool. Soc. London, p. 242, 1889 (Muscat).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—Günther, Journ. Mus. Godeffroy, pt. 17, p. 478, 1910 (Ponapé).—Zugmayer, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8 (Mekran and Oman), p 17 (Gwadar), 1913.—Tirant, Service Océanogr. Pêches Indo-Chine, 6^{e} note, p. 61, 1929 (Cochinchina).

Carcharias (*Aprionodon*) *acutidens* Duméril, Hist. Nat. Elasmobr., vol. 1, p. 349, 1865 (Red Sea; Mexico?).—Schmeltz, Cat. Mus. Godeffroy, no. 5, p. 40, 1874 (Australia).

Squalus acutidens Gray, List fish British Museum, p. 43, 1851 (compiled).

Aprion acutidens Schmeltz, Cat. Mus. Godeffroy, no. 4, p. 28, 1869 (Port Mackay).

Aprionodon acutidens Garman, Mem. Mus. Comp. Zool., vol. 36, p. 118, 1913 (Apiang).—Ogilby, Mem. Queensland Mus., vol. 5, p. 80, 1916 (Torres Strait specimen).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—Fowler, Mem. Bishop Mus., vol. 10, p. 22, 1928 (Apiang specimen); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).—Chevey, Inst. Océanogr. Indochine. 19^{e} note, p. 6, 1932 (Indochina).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).—Tortonese, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, no. 63, p. 9, 1935–36 (Massaua, Mar Rosso).

Carcharias forskalii (Ehrenberg) Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 658, 1871 (name in synonymy).

Carcharias forskålii Hilgendorf, Symbol. Phys. Hemprich Ehrenberg, p. 8, pl. 5, fig. 2, 1899 (type locality: Red Sea).

Carcharias munzingeri Kossmann and Räuber, Zool. Ergebn. Reise Roth. Meer., vol. 1, p. 31, 1877 (type locality: Red Sea).

Depth 7¼ to subcaudal origin; head 3⅘, width 1¾. Snout 3⅔ in head; eye 11¾, 3½ in snout, about 7 in interorbital; mouth length 1½ in its width, or little greater than preoral length; mouth width 2⅕ in head; preoral length 4¼; teeth entire, bases broad, cusps erect, narrow, lanceolate, upper slightly notched basally; nostrils midway in preoral length, with rather broad inner lobe, internarial equal to preoral length; interorbital 1⅘ in head, moderately high. Gill openings equidistant, last 2 above pectoral.

Scales small, with 3 to 5 keels and as many points.

First dorsal inserted opposite hind inner pectoral angle, front edge 1⅖ in head; second dorsal origin little before anal origin, front fin edge 1⅔ in head; anal little smaller than second dorsal, front fin edge 2⅖ in head; least depth of caudal peduncle 7⅓; pectoral 1⅛, width 1⅔ its length; ventral length 2⅛ in head; caudal 2⅘ in rest of body, subcaudal 2⅒ in caudal.

Gray-brown above, below whitish. (Hilgendorf.)

Red Sea, Arabia, Seychelles, India, Indochina, North Australia, Queensland, Micronesia. Rüppell's type was 763 mm. long, and his figure differs a little from that published by Hilgendorf in that the second dorsal and anal are shown subequal in size, the pectoral greatly smaller or 1⅓ in head so the first dorsal origin would fall about opposite the depressed pectoral tip. Day gives a figure differing from Hilgendorf's in the more advanced first dorsal, the origin of which is shown close behind the narrow pectoral base, the anal length 1½ in that of second dorsal, the small pectoral very slightly longer than that of the head measured to the first gill opening and the upper tooth rather broadly triangular and serrated. In his description Day says of the teeth, "none serrated" and that he has obtained specimens up to 1,830 mm. It is quite evident that *Carcharias munzingeri* Kossmann and Räuber is intended for the present species, the only distinction seemingly from the very imperfect notice given resting on its larger dorsal fins, the remarks on the dention hardly of any value.

Garman in describing an example from the Gilbert Islands characterizes the labial folds as short, the upper directed outward and a little forward, lower hidden in the angle. He also describes the pectoral width ⅘ the fin length and the edges of the hindmost fins blackish.

APRIONODON SITANKAIENSIS Herre

Aprionodon sitankaiensis Herre, Fishes Herre Philippine Exped. 1931, p. 11, 1934 (type locality: Sitanki, Sibutu Islands, Sulu Archipelago).—Roxas and Martin, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 14, 1937 (reference).

Greatest depth equals 1¹⁄₁₂ greatest width; head 3⅘, as measured to fifth gill opening, depressed anteriorly. Snout 2⅚ in head, bluntly rounded; eye 9½, small, 2½ in postocular region measured to first gill opening, and trifle smaller than latter; mouth arched, nearly long as wide, length 3½ in head, width 3⅒; labial fold in angle of jaws, barely extends upon upper jaw; teeth 29 above, 31 below, not serrated; upper teeth nearly erect to somewhat oblique, with broad base having a large denticle on inclined side; lower teeth erect or almost so, without serrations or basal denticles; median row of teeth in each jaw small and erect. Last gill opening only ⅔ wide as others, and 2 posterior gill openings over pectoral base.

First dorsal little nearer ventral than pectoral, hind edge very concave and hind angle produced; second dorsal and anal almost opposite, or anal origin very little advanced; hind anal edge much more indented than that of second dorsal; caudal 2½ in length; pectoral reaches hind end of first dorsal base, width 1⅘ its length, fin falciform, with deeply concave hind margin, angles rounded.

In alcohol blackish slate-blue on upper half, including dorsals, caudal, and upper side of pectorals. Under side whitish. Blackish spot on under side of pectoral tip. Ventrals and anals broadly edged with dusky bluish.

Length, 380 mm. (Herre.)

Sulu Archipelago. This nominal species, described without any comparison with the other species in its genus, seems most closely related to *Aprionodon acutidens* in its short snout, if indeed it is really distinct.

APRIONODON BREVIPINNA (Müller and Henle)

Carcharias (*Aprion*) *brevipinna* Müller and Henle, Syst. Beschr. Plagiostomen, p. 31, pl. 9, 1841 (type locality: Java).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 25, 1852.

Carcharias (*Prionodon*) *brevipinna* Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 4, p. 509, 1853 (Batavia, Java).

Carcharias (*Aprionodon*) *brevipinna* Duméril, Hist. Nat. Elasmobr., vol. 1, p. 348, 1865 (compiled).

Carcharias brevipinna Günther, Cat. fishes British Mus., vol. 8, p. 361, 1870 (Java).—Boulenger, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat., Kl., vol. 117, pt. 1, p. 678, fig. 4, 1908 (head below) (Japan).—Zugmayer, Abh. Kon. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).

Squalus (*Aprion*) *brevipinna* Gray, List fish British Museum, p. 42, 1851 (reference).

Aprionodon brevipinna Garman, Mem. Mus. Comp. Zool., vol. 36, p. 117, 1913 (Java).—Jordan, Tanaka, and Snyder, Journ. College Sci. Tokyo, vol. 33, p. 14, 1913 (Japan).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus., Vertebrata, p. 190, 1920 (Boshiu).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).

Depth 7⅓ to subcaudal origin; head 3⅔, width about 2 ? Snout 2⅖ in head, narrowing forward; eye 9½, 3⅘ in snout, 6 in interorbital; mouth length 1⅓ its width, which about 3⅗ in head; preoral length 2½ in head; upper teeth in 36 rows, lower in 33 rows, entire, bases broad, narrow cusps erect; nostrils about last third in preoral length, inner lobe broad and short, internarial half preoral length; interorbital moderate. Gill openings equidistant, last above pectoral.

Scales very small with 3 to 5 keels, with as many points.

First dorsal origin opposite inner pectoral angle, front fin edge 1⅔ in head; second dorsal inserted opposite first basal third of anal, fin length 3 in head; anal length 2⅓; least depth of caudal peduncle 5⅖; pectoral 1½, width 2⅕ in its length; ventral length 3⅖ in head; caudal 2⅘ in rest of body, subcaudal 2½ in caudal.

Gray-brown, below paler. (Müller and Henle.)

Arabia, East Indies, Japan. According to Garman the mouth with labial folds in the angles only.

Genus HYPOPRION Müller and Henle

Hypoprion Müller and Henle, Syst. Beschr. Plagiostomen, p. 34, 1841. (Type, *Carcharias* (*Hypoprion*) *macloti* Müller and Henle, designated by Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 61, 1883.)

Hypoprionodon Gill, Ann. Lyceum Nat. Hist. New York, vol. 7, pp. 399, 401, 409, 1862. (Type, *Carcharias* (*Hypoprion*) *hemiodon* Müller and Henle, orthotypic.)

Differs little from *Eulamia* and the distinction in the lower erect smooth-edged teeth and only the bases of the upper teeth serrated. Indo-Pacific, Atlantic. Fossils known from the Miocene.

ANALYSIS OF SPECIES

a^1. Second dorsal smaller than anal.
  b^1. Snout elongate, pointed; first dorsal origin above inner pectoral angle; second dorsal origin above hinder third of anal base---------- macloti
  b^2. Snout shorter, moderate; first dorsal close behind pectoral; second dorsal origin little behind anal origin------------------------------- hemiodon
a^2. Second dorsal and anal equal, fins opposite; snout broad and broadly rounded; first dorsal nearer pectoral bases than ventrals------ playfairii

HYPOPRION MACLOTI (Müller and Henle)

Carcharias (*Hypoprion*) *macloti* Müller and Henle, Syst. Beschr. Plagiostomen, p. 34, pl. 10, 1841 (type locality: New Guinea).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 350, 1865 (type).

Carcharias macloti Günther, Cat. fishes British Mus., vol. 8, p. 362, 1870 (compiled).—Day, Fishes of India, pt. 4, p. 713, pl. 188, fig. 2, 1878.—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 357, 1881 (Port Jackson).—Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1768, 1888 (Port Jackson).—Day, Fauna British India, Fishes, vol. 1, p. 12, 1889.—Pellegrin, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 2. 1912 (no locality).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran).

Carcharias mccloti Duncker, Mitt. Naturh. Mus. Hamburg, vol. 21, p. 192, 1904 (locality ?).

Squalus (*Hypoprion*) *macloti* Gray, List fish British Museum, p. 43, 1851 (compiled).

Hypoprion macloti Garman, Mem. Mus. Comp. Zool., vol. 36, p. 121, 1913 (New Guinea, Indian Ocean).—Waite, Rec. South Australian Mus., vol. 2, p. 12, fig. 9, 1921 (copied).—McCulloch, Fishes New South Wales, ed. 2, p. 5, pl. 1, fig. 9a, 1927.—Fowler, Mem. Bishop Mus., vol. 10, p. 21, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (compiled).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).—Fowler, List Fish. Malaya, p. 10, 1938 (reference).

Hypoprion? (*Hemigaleus*)*?* *heterodus* Philippi, Anal. Univ. Chile, vol. 71, p. 541, pl. 2, fig. 6, 1887 (type locality: Chile).

Hypoprion ? (*Hemigaleus*) ? *isodus* Philippi, Anal. Univ. Chile, vol. 71, p. 542, pl. 2, fig. 5, 1887 (type locality: Chile).

Depth $6\frac{3}{4}$ to subcaudal origin; head $3\frac{4}{5}$, width $2\frac{1}{5}$. Snout $2\frac{1}{3}$ in head, narrowly triangular; eye $7\frac{2}{5}$, $3\frac{1}{5}$ in snout, $3\frac{3}{5}$ in interorbital; mouth cleft $3\frac{3}{5}$ in head, about $\frac{9}{10}$ its width, which $1\frac{1}{3}$ in preoral length; short labial fold behind each mouth angle, not extending on jaws; teeth in 27 rows in jaws, slightly inclined, bases of upper denticulated on each side of rather narrowly triangular large cusp, lower teeth entire and narrower; nostrils about last ⅖ in preoral length, valve with small pointed lobe, internarial 1⅘ in preoral length or about equals mouth cleft; interorbital 2⅞ in head, low. Gill openings equidistant, last smallest and last 2 above pectoral base.

Scales minute, with 3 to 5 keels and as many points behind.

First dorsal origin above inner pectoral angle, front fin edge 1¾ in head; second dorsal smaller than anal, origin above last third of anal base, fin length 2⅞ in head; anal length 2¼; least depth of caudal peduncle 5½; pectoral 1⅖, width 1⅞ its length; ventral length 2¾ in head, clasper slender, little longer than fin; caudal 2⅘ in rest of body, subcaudal 2⅕ in caudal.

Gray-brown, whitish below. (Müller and Henle.)

Mekran, India, East Indies, New South Wales. Also Chile in the Eastern Pacific. According to Duméril the type is 660 mm. long.

HYPOPRION HEMIODON (Müller and Henle)

Carcharias (*Hypoprion*) *hemiodon* (Valenciennes) Müller and Henle, Syst. Beschr. Plagiostomen, p. 35, pl. 19, fig. 12, 1841 (teeth) (type locality: Pondicherry).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 351, 1865 (types).—Meyer, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 48, 1885 (North Celebes; Manila Bay, Luzon).

Carcharias hemiodon Günther, Cat. Fishes British Mus., vol. 8, p. 362, 1870 (India, Calcutta).—Day, Fishes of India, pt. 4, p. 714, 1878 (India, Hooghly at Calcutta).—Macleay, Proc. Linn. Soc. New South Wales, vol. 2, p. 366, 1878 (Port Darwin).—Day, Fauna Brit. India, Fishes, vol. 1, p. 12, 1889.—Boulenger, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—Elera, Cat. Fauna Filip., vol. 1, p. 613, 1895 (Luzon, Manila Bay).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—Weber, *Siboga* Exped., Fische, vol. 57, p. 590, 1913 (Dama and northwest Waigiu).—Tirant, Service Océanogr. Pêches Indo-Chine, 6e Note, p. 79, 1929 (Saigon River to Thudaumot).

Squalus (*Hypoprion*) *hemiodon* Gray, List Fish British Museum, p. 43, 1851 (Pondicherry).

Hypoprion hemiodon Garman, Mem. Mus. Comp. Zool., vol. 36, p. 122, 1913 (Pondicherry, India, Calcutta).—Waite, Rec. South Australian Mus., vol. 2, p. 12, 1921 (not fig. 9).—Fowler, Mem. Bishop Mus., vol. 10, p. 21, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).—Chevey, Inst. Océanogr. Indochine, 19e note, p. 6, 1932 (Cochinchina).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).—Roxas and Martin, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 13, 1937 (reference).

Snout moderate, blunt, much shorter than in *Hypoprion macloti;* teeth in 29 to 32 rows above, 29 to 27 below; upper subtriangular, slightly oblique, smooth on inner edge, notched on outer and with several blunt denticles on basal portion; lower not or serrated only on outer basal portions, cusps narrower, on broad bases, nearly erect;

row of smaller median teeth above and below; nostrils little smaller than eyes, midway in preoral length; internarial between outer nasal angles equals preoral length.

First dorsal close behind pectoral, upper angle rounded, hinder acuminate, hind edge indented; second dorsal above anal, origin little behind anal origin, base ⅔ anal base length, upper angle blunt, hinder acuminate; hind anal angle acute, hinder margin deeply notched; outer and inner pectoral angles rounded, hind edges concave.

Blackish gray, lighter below. (Garman.)

Arabia, India, East Indies, Indo-China, North Australia. Reported from the Philippines by Elera. According to Duméril the largest of the 4 types measures 550 mm.

HYPOPRION PLAYFAIRII (Günther)

Carcharias playfairii Günther, Cat. Fish. Brit. Mus., vol. 8, p. 362, 1870 (type locality: Zanzibar).

Hypoprion playfairii Garman, Mem. Mus. Comp. Zool., vol. 36, p. 122, 1913 (Zanzibar).

Snout short, obtusely rounded; preoral length rather more than mouth length, 1½ in mouth width; teeth in 29 rows above, 28 rows below, alike in jaws, erect, constricted, on broad 2-rooted base, upper rather broader than lower and with some obtuse denticulations on base; nostrils midway between snout end and mouth. Gill openings much wider than orbit.

First dorsal fin nearer pectoral base than ventral base; second dorsal equal in size and form and exactly opposite anal, ⅓ size of first dorsal; caudal 4 in total; pectorals of moderate length and width, not extending to end of first dorsal, length of inner margin ⅓ of outer.

Extremities of all fins with black spot. Length, 416 mm. (Günther.)

Zanzibar. This species based on a stuffed, likely dry, example in the British Museum.

Genus EULAMIA Gill

Eulamia Gill, Ann. Lyceum Nat. Hist., New York, vol. 7, p. 401, 1862. (Type, *Carcharias lamia* Risso, orthotypic.)

Platypodon Gill, Ann. Lyceum Nat. Hist., New York, vol. 7, p. 401, 1862. (Type, *Carcharias* (*Prionodon*) *menisorrah* Müller and Henle, orthotypic.)

Isogomphodon Gill, Ann. Lyceum Nat. Hist. New York, vol. 7, p. 401, 1862. (Type, *Carcharias* (*Prionodon*) *oxyrhynchus* Müller and Henle, orthotypic.)

Lamiopsis Gill, Ann. Lyceum Nat. Hist., New York, vol. 7, p. 401, 1862. (Type, *Carcharias* (*Prionodon*) *temminckii* Müller and Henle, orthotypic.)

Isoplagiodon Gill, Ann. Lyceum Nat. Hist., New York, vol. 7, p. 401, 1862. (Type, *Carcharias* (*Prionodon*) *sorrah* (Valenciennes) Müller and Henle, orthotypic.)

Gymnorhinus (not Maximillian, 1841, in birds) Hilgendorf, Symbol. Phys. Hemprich-Ehrenberg, p. 8, 1899. (Type, *Carcharias* (*Prionodon*) *menisorrah* Müller and Henle.)

Mapolamia Whitley, Mem. Queensland Mus., vol. 10, pt. 4, pp. 185, 188, 1934. (Type, *Carcharias melanopterus* Quoy and Gaimard, orthotypic.)

Gillisqualus Whitley, Mem. Queensland Mus., vol. 10, pt. 4, pp.185, 189, 1934. (Type, *Carcharinus amblyrhynchos* Ogilby=*Carcharias* (*Prionodon*) *amblyrhynchos* Bleeker, monotypic.)

Galcolamnoides Whitley, Mem. Queensland Mus., vol. 10, pt. 4, pp. 185, 191, 1934. (Type, *Carcharias macrurus* Ramsay and Ogilby, orthotypic.)

Body robust. Head depressed, wide. Snout produced in front. Eyes with well-developed nictitating membranes. Mouth inferior, curved forward, labial folds rudimentary or short. Teeth compressed, subtriangular, with single large sharp cusp, strongly serrated with age though less so in young; upper teeth broad or narrow, lower narrow, straight, nearly erect. Nostrils inferior, separated from mouth and from one another. No spiracle. Embryo attached to uterus by placenta. First dorsal large, not far behind pectorals. Second dorsal small. Caudal with vertebral axis moderately elevated, subcaudal lobe produced. Caudal with pits at root. Pectoral falcate.

Temperate and tropical seas, some species ascending fresh waters or even residing in them.

"These species are commonly seen slowly following the vessel in fine weather and light winds, especially when the salt meat for daily consumption is towed behind the ship, as is the general custom, in a sort of keg, to be soaked. The Shark is then seen cruising about, with dorsal fin projecting above the surface, and as soon as anything is thrown into the water, it is at once pounced upon by the fish. Bits of wood and other inedible substances are readily seized, but soon discarded. The Shark is consequently an easy catch, but the hook should be of suitable thickness, the line strong and furnished with some iron links next the hook to prevent it from being bitten off. These fishes do not disdain any animal substance or filth. In securing any floating object, they open their jaws over it quite leisurely and raise the whole head above the surface, the mouth being situated on the ventral side; but upon objects that sink in the water they dart with great rapidity. In taking a baited hook, the Shark turns upon its side or completely over, with the belly upwards, as the snout would else come in contact with the line and push the bait away. When the wind is at all high, these Sharks are never seen, presumably because they are sluggish swimmers and cannot keep up with the vessel. In all their actions they greatly resemble a hungry dog or wolf prowling in quest of food; hence the names *chien de mer*, *grand chien bleu*, etc., which are conferred upon them in several languages. Most frequently these Sharks are attended by a little fish known among seamen as the *Pilot* (*Naucrates ductor*.) This fish, which is about a foot long, presents a handsome appearance, being silvery blue with broad transverse bands of dark blue. Seafaring folk in general suppose that it guides the Shark to the prey in the hope of gaining its share thereof, and this belief has been supplemented by all kinds of romantic additions. Cuvier, who discussed the improbability of these fabulous narratives, was of the opinion that the companionship of the Shark and the Pilot fish is merely fortuitous, each of them following the vessel. But this is not the case. The Pilot-fish really attends upon the Shark, but only to feed upon its excrements, as a few writers, ancient and modern, have correctly stated. I have often had the opportunity on tropical seas of carefully watching Sharks accompanied by one or two Pilot-fish, and have always made the same observation. The Pilot-fish keeps close to the body of the Shark, at the dorsel, pectoral, or ventral fins, but now and then quits his post to take some floating object he has espied. Apparently, however, he seldom finds anything that tickles his palate, and soon returns to the Shark; but the moment the Shark passes any excrementitious matter the Pilot promptly and eagerly makes off to secure the prize, and then returns to its former station, from which it refuses to be enticed for a long while, whereas, when it is hungry, it readily swims after any small object thrown into the water. I never succeeded in hooking a specimen. In the Bay of Bengal I had good opportunity of observing that large turtles are also attended by the same kind of Pilot-fish; and *Sucking-fishes* (*Echeneis*) accompany both Sharks and turtles, for the same reason as the Pilot, but always adhere firmly to the body of their host, till they see any morsel of food, when they vie with the Pilot-fish in agility, and, their errand accomplished, immediately return to attach themselves as before." (Sundevall.)

ANALYSIS OF SPECIES

a^1. ISOPLAGIODON. Second dorsal smaller than anal.

- b^1. Second dorsal and anal origins opposite.
  - c^1. Snout elongate -- limbata
  - c^2. Snout moderate, rather pointed.
    - d^1. Preoral length 1½ in mouth width; gill openings twice deep as eye width -- brachyura
    - d^2. Preoral length greater than mouth width; eye greater than half depth of gill openings -- macrura
  - c^3. Snout moderately rounded, narrow, shovel-shaped, not acute, longer than mouth width; color bronze brass -------------------------- ahenea
  - c^4. Snout pointed before eyes, length less than mouth width - amblyrhynchos
  - c^5. Snout short, blunt, length less than mouth width -------------- stevensi
- b^2. Second dorsal origin behind anal origin; snout moderate, blunt, nostrils about midlength -- sorrah

a^2. PLATYPODON. Second dorsal and anal equal in size.
- e^1. Second dorsal origin before anal origin; snout short, bluntly rounded; fins tipped with black __________________ melanoptera
- e^2. Second dorsal and anal origins opposite.
  - f^1. Snout obtusely pointed; pectoral ⅔ wide as long____ menisorrah
  - f^2. Snout somewhat extended; pectoral twice wide as long. spallanzani
  - f^3. Snout moderate, bluntly rounded; pectoral less twice long as wide. dussumieri
  - f^4. Snout rather extended and pointed________________ pleurotaenia
- e^3. Second dorsal origin behind anal origin; snout narrowly rounded in front____ tephrodes

a^3 EULAMIA. Second dorsal larger than anal.
- g^1. Second dorsal origin before anal origin.
  - h^1. Snout very short, nostrils near end______________ gangetica
  - h^2. Snout moderate.
    - i^1. Pectoral long, moderately wide____________________ lamia
    - i^2. Pectoral long, narrow______________________ albimarginata
  - h^3. Snout short, obtuse; pectorals broad.
    - j^1. Upper teeth narrow; lower narrow, lanceolate__ ellioti
    - j^2. Upper teeth broad, triangular; lower narrow_ temminckii
- g^2. Second dorsal origin opposite anal origin; snout moderate, blunt; pectoral longer than wide_________________________ munsing

Subgenus ISOPLAGIODON Gill

EULAMIA LIMBATA (Müller and Henle)

Carcharias (*Prionodon*) *limbatus* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 49, pl. 19, fig. 9 (teeth), 1841 (no locality).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 375, 1865 (Martinique: Bahia).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 115, pt. 1, p. 1425, 1906 (Upolu, Samoa); Denkschr. Akad. Wiss. Wien, math.-nat. Kl. vol. 71, pt. 1, p. 160, 1907 (Gischin).

Carcharias limbatus GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 373, 1870 (Seychelles, Indian Ocean).—DAY, Fishes of India, pt. 4, p. 716 (not pl. 184, fig. 2), 1878; Fauna British India, Fishes, vol. 1, p. 17, 1889 (copied).—SAUVAGE, Hist. Nat. Madgascar, Poiss., p. 510, 1891 (reference).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 481, 1910 (Indian Ocean).—ROBINSON, Natal Fisher. Rep., 1919, p. 50 (Natal).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e note, p. 61, 1929 (Cochinchina).

Carcharinus limbatus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 127, 1913 (tropical and temperate seas; Rio Janeiro).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 26, 1925 (Natal coast).—CHEVEY, Inst. Océanogr. Indochine, 19^e note, p. 6, 1932 (Cochinchina).

Eulamia limbatus FOWLER, Mem. Bishop Mus., vol. 10, p. 19, 1928 (compiled); Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 362, 1935 (Durban); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 48, fig. 10, 1936 (compiled).

Eulamia limbata FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 491, 1930 (reference).

Carcharias microps LOWE, Proc. Zool. Soc. London, 1840, p. 38 (type locality: Madeira).

Prionodon cucuri CASTELNAU, Animaux Nouv. Amer. Sud, Poiss., p. 99, 1855 (type locality: Bahia).

Isogomphodon maculipinnis Poey, Report Hist. Nat. Cuba, vol. 1, pp. 191, 450, pl. 4, figs. 3-4, 1866 (type locality: Cuba).

Carcharias (*Prionodon*) *mülleri* Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 56, p. 356, 1867 (type locality: West Indies and Surinam).

Carcharias ehrenbergi Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 661, 1871 (type locality: Koseir, Red Sea).—Brusina, Glasnik Naravosl. Družtva, vol. 3, p. 234, 1888 (Red Sea).

Carcharias abbreviatus (Ehrenberg) Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 661, 1871 (name in synonymy).

Gymnorrhinus abbreviatus Hilgendorf, Symbol. Phys. Hempr.-Ehrenberg, p. 8, pl. 7, fig. 2, 1899 (type locality: Red Sea).

Carcharias aethalorus Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, p. 104, 1882 (type locality: Mazatlan, Mexico).

Depth 5½ to subcaudal origin; head 3¾, width 1⅔. Snout 2⅓ in head; eye 8⅓, 3⅗ in snout, 4 in interorbital; mouth width 2⅗ in head, well arched, length 1¼ its width, short labial fold at angle, slightly extended forward on each jaw with short groove behind; teeth in 34 rows above, 31 below, bases broad, cusps narrow, upper serrate on bases and somewhat on sides of cusps, lower not serrate on cusps or sometimes bases with coarse serrations; upper median teeth small, median lower tooth small and tooth each side little larger; nostrils little smaller than eye, little behind middle in preoral length, internarial 1¾ in preoral, which slightly wider than mouth angle; interorbital 2⅓, rather well elevated, convex. Three median gill openings largest, all equidistant, last smallest and last 2 over pectoral.

Scales tricarinate, with as many points to each.

First dorsal origin over or little before inner pectoral angle, front fin edge 1⅖ in head; of second dorsal 3⅞, fin length 2½; front edge of anal 3⅖, fin length 2½, origin opposite first ⅖ of second dorsal base; least depth of caudal peduncle 5 in head; pectoral 1⅕, width 2¼ its length, which 1⅗ to ventral; ventral length 2⅛ in head; front edge of subcaudal 1⅔; caudal 2⅔ in rest of body.

Brown above, whitish below. Tips of first dorsal, pectoral, and subcaudal black, sometimes also second dorsal and anal. Reaches 1,983 mm. (Garman; Hilgendorf.)

Red Sea, Arabia, Natal, Seychelles, Cochinchina, Polynesia. Also in the tropical Atlantic.

EULAMIA BRACHYURA (Günther)

Carcharias brachyurus Günther, Cat. Fishes British Mus., vol. 8, p. 369, 1870 (type locality: New Zealand).—Hector, Colonial Mus. Governm. Surv. Dep. Fishes New Zealand, p. 75, 1872 (compiled).—Waite, Rec. Canterbury Mus., vol. 1, No. 1, p. 7, 1907 (reference).

Carcharinus brachyurus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 128, 1913 (New Zealand; not Australian records).—Phillipps, New Zealand Journ. Sci. Techn., vol. 6, p. 261, fig. 4, 1924 (North Island).

Eulamia brachyura Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 491, 1930 (part).

Galeolamnoides brachyurus Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Eulamia macrura (not Ramsay and Ogilby) Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).

Snout rather pointed, of moderate length; preoral more than snout length or about ⅔ its width; upper teeth oblique, serrated on both edges, with deep notch on outer margin; lower teeth narrow, erect, lanceolate, serrated, on wide 2-rooted base; nostrils much nearer mouth than snout end or nearer latter than mouth angle. Gill openings at least twice wide as eye.

First dorsal nearer pectorals than ventrals, distance from pectorals but little less than its base length; second dorsal very small, shorter and lower than anal; anal origin opposite second dorsal origin and midway between ventral and caudal; caudal 4 in total; pectoral narrow, pointed, falciform, length of inner edge ¼ of outer.

Coloration uniform. Length 2,360 mm. (Günther.)

New Zealand.

EULAMIA MACRURA (Ramsay and Ogilby)

Carcharias macrurus Ramsay and Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 2, pt. 1, pp. 163, 1024, 1887 (type locality: Port Jackson, New South Wales).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 2, 1888 (type; Port Jackson); Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1768, 1888 (Port Jackson, Broken and Botany Bays).

Carcharhinus macrurus McCulloch, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 457, pl. 37, figs. 1–4, 1921 (type; Botany Bay; Port Jackson).—Whitley, Australian Zool., vol. 5, p. 354, 1929 (note).

Galcolamnoides macrurus Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference); Australian Zoologist, vol. 8, pt. 4, p. 214, pl. 13, fig. 1, 1937 (Middleton and Elizabeth Reefs).

Carcharias brachyurus (part) Günther, Cat. Fishes British Mus., vol. 8, p. 369, 1870 (Australian specimen).—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 352, 1881 (not description).—Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1768, 1889 (note).—Waite, Mem. New South Wales Nat. Club, No. 2, p. 7, 1904; Rec. Australian Mus., vol. 6, pt. 3, p. 226, pl. 39, 1906 (Lake Macquarie).—Stead, Fishes of Australia, p. 232, 1908.

Carcharinus brachyurus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 128, 1913 (Australia; not New Zealand).—Waite, Rec. South Australian Mus., vol. 2, p. 12, fig. 8, 1921.

Carcharhinus brachyurus McCulloch, Cat. Fish. New South Wales, ed. 2, p. 5, pl. 1, 1927.

Eulamia brachyura Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 491, 1930 (New South Wales; not New Zealand).

Depth 5¼ to 6⅗ to subcaudal origin; head 3⅗ to 3⅞, width 1⅗ to 1¾. Snout 2¼ to 2½ in head, rather broadly convex in profile as seen from above; eye 7 to 8, 3⅔ to 4 in snout, 4¾ to 5 in interorbital; dentary width 2¾ to 2⅞ in head, length 1⅗ in its width, with very short inconspicuous upper labial groove; teeth in 35 rows above, 30 rows below, serrated; nostrils about last ⅖ in preoral space; internarial 1⅓ in dentary width, anterior valve obtuse, short; interorbital width 1⅘ to 2 in head, broadly convex. Gill openings small, equidistant, last 2 above pectoral base, fifth smallest.

Scales tridentate, median point longest and each with three parallel keels.

First dorsal origin opposite inner pectoral angle, front edge 1⅓ to 2 in head, hind lobe narrow triangular point; second dorsal origin opposite anal origin, equal or slightly smaller in size than anal, front edge 3 to 3¾ in head, hind lobe narrow triangular point; front anal edge 3 to 3⅘; caudal 2⅗ in rest of body, subcaudal lobe 2¼ to 2⅞ in caudal length; pectoral 1¼to 1⅓ in head, width 1¾ to 2 in its length; ventral length 2¼ to 3 in head.

Largely uniform grayish brown, to little paler below.

New South Wales.

U.S.N.M. No. 28666. North of Mount Macleay. Australian Museum. Length, 525 mm.

U.S.N.M. No. 28690. North of Mount Macleay. Australian Museum. Length, 390 mm.

U.S.N.M. No. 39990. Port Jackson. Australian Museum. Head and body skinned out 1,110 mm. long. This shows: Snout 2⅛ in head; eye 11½, 5 in snout, 6 in interorbital; upper teeth broader, all entire. Second dorsal much smaller than anal, their origins apparently opposed. Pectoral width half its length.

EULAMIA AHENEA Stead

Eulamia ahenea Stead, Australian Nat., vol. 10, pt. 2, p. 98, 1938 (type locality: 4 miles east of North Head; off Sydney Heads; in 23 fathoms off South Head of Port Jackson).

Body somewhat compressed. Head broader than high, somewhat flattened anteriorly; tapers from gills. Snout moderate, rather moderately rounded, narrow, shovel-shaped, not acute, length ⅙ greater than mouth depth. Eye small, diameter ⅕ mouth depth, front orbital edge just behind front edge of mouth. Mouth large, crescentic, labial fold at angle short. Teeth almost erect in lower jaw, well inclined toward angle in upper jaw, 32 rows above, 32 rows below; bases broad in both jaws; cusps very narrow in lower jaw; much broader in upper jaw, but considerably narrower than in *Eulamia brachyura;* deeply notched on posterior edge; upper teeth finely serrate on bases and on cusps; median upper teeth fairly large; median lower teeth small. Nostrils smaller than eye, ⅔ distance from snout end to orbit. Gill openings fairly large; last one slightly posterior to position of base of pectoral fin.

First dorsal origin above end of posterior pectoral margin. Second dorsal small; basal length equal to ⅓ distance to caudal pit. Anal little larger than second dorsal, almost directly below, base longer, posterior edge deeply notched with 2 sharp angles. Caudal nearly 4 in total length; lower lobe produced, pointed. Pectoral subfalciform; outer angles rather sharp, inner blunt rounded; reaches almost to end of first dorsal base. Ventral small, situated about 3/5 of distance between dorsal bases. Deep pit above caudal peduncle.

When fresh a bronze brass color "like a new penny," almost pale golden at times. Gray or cream strip along sides from eyes. Creamy white below.

Length to 9 feet (2,745 mm.). (Stead.)

New South Wales, Australia. General form rather elegant; body rather more rounded below than in *Eulamia brachyura;* snout also rather more flattened both above and below.

EULAMIA AMBLYRHYNCHOS (Bleeker)

Carcharias (*Prionodon*) *amblyrhynchos* BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 10, p. 467, 1856 (type locality: Java Sea near Solombo Island); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 364, 1865 (compiled).

Carcharias amblyrhynchus GÜNTHER, Cat. Fishes Brit. Mus., vol. 8, p. 368, 1870 (compiled).

Carcharinus amblyrhynchus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 128, 1913 (compiled).

Carcharhinus amblyrhynchos OGILBY, Mem. Queensland Mus., vol. 5, pp. 81, 94, 1916 (Cape Bowling Green, Queensland).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—GILTAY, Mem. Mus. Roy. Nat. Hist. Belg., Hors ser. 5, vol. 3, p. 9, fig. 1, 1933 (dentition) (Dobo, Aru Island).

Eulamia amblyrhynchos FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 491, 1930 (reference); List Fish. Malaya, p. 8. 1938 (reference).

Gillisqualus amblyrhynchoides WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, 1934, p. 189, fig. 49 (type locality: Cape Bowling Green, Queensland), p. 198 (reference), 1934.

Depth 7 7/10 in total length, body elongate, compressed; head 5, twice wider than deep. Snout pointed; eye 3½ in snout, pupil oblong vertical; mouth width less than preoral, much broader than long, lower labial groove little longer than upper; upper teeth triangular, little inclined, all serrated; lower teeth slender, serrated, bases broad; nostrils much nearer snout tip than mouth, short valve triangular. Last gill opening above pectoral.

Scales very small, with 5 to 7 keels. Lateral line simple.

First dorsal nearer pectoral than ventral, more than twice lower than body depth, apex acutely rounded; second dorsal 5 times its length from first dorsal, 3 times lower or shorter than first dorsal, longer than high, opposite anal; anal midway between caudal and ventral, higher than second dorsal, but little wider, apex acute; caudal 4 in total length, subcaudal 5 1/10; pectoral little longer than head, 5 3/5 in total body length, much less double longer than wide, emarginate, acute; ventrals oblique, quadrate, emarginate, one-fourth as long as pectoral.

Body and fins above coppery bluish, below white. Iris gray, pupil silver gray. Pectoral white below, apex blackish. Ventral and caudal margined with blackish. Length, 1,540 mm. (Bleeker.)

Singapore, East Indies, Queensland.

EULAMIA STEVENSI (Ogilby)

Carcharias stevensi OGILBY, Ann. Queensland Mus., No. 10, p. 38, 1911 (type locality: Bustard Bay and North West Islet, Queensland).

Carcharhinus stevensi OGILBY, Ann. Queensland Mus., No. 10, p. 37, 1911 (reference); Mem. Queensland Mus., vol. 5, p. 80, 1916 (types).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—MCCULLOCH, Fishes New South Wales, ed. 2, p. 5, 1927.

Eulamia stevensi FOWLER, Proc. 4th (1929) Pac. Sci. Congress, Java, p. 491, 1930 (compiled).

Galeolamnoides stevensi WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 191 (Moreton Bay), p. 198 (reference), 1934.

Depth 5⅓ to 5¾ in total length; head 4⁹⁄₁₀, width 1⅖. Snout 2⅔ in head, short, blunt; eye midway between snout tip and second gill opening, 3½ to 4 in preoral length; mouth width 2¼ in head, length 1¼ width, rounded, labial grooves short, upper deeper than lower; teeth 29 rows above, 30 below, upper triangular, both edges finely serrated and scarcely notched; lower teeth erect, entire, narrow, base moderately broad, front pair very small; preoral length 3⅕ in head; internarial 1⅕; interocular width 1⁹⁄₁₀. Gill openings wide, last 1½ in third, which 2½ to 3 times eye diameter.

First dorsal inserted ½ nearer pectoral than ventral, front border linear, hind angle produced and acute, not nearly reaching vertical of ventral, fin height ¹⁄₁₀ more than basal length; second dorsal inserted ⅛ nearer tail tip than first dorsal origin, interdorsal 1⅕ in predorsal length and 1⁷⁄₁₀ times first dorsal base; caudal 3½ to 3⅘ in total length, upper angle obtusely pointed; front edge of subcaudal 2¹⁄₁₀ in caudal; anal origin opposite second dorsal origin, length 1⅕ in space to subcaudal, which 1⅕ to 1⅖ in that from ventral; pectoral 4⅕ to 4½ in total body length, inserted little nearer snout tip than to ventral, extends below end of first dorsal, front and hind borders convex, outer emarginate, upper angle pointed and lower rounded; space between ventral and anal 3 to 3⅕ in space from pectoral.

Ash blue above, white below. Length, 164 to 187 mm. (Ogilby.)

Queensland, New South Wales. According to Ogilby the extreme shortness of the postventral region, which is at least ¼ less than head and trunk, is diagnostic. He gives the short tail length as 1¼ to 1⅖ in head and trunk. I place this species provisionally near

Eulamia amblyrhynchos, though Ogilby fails to give the proportions of the second dorsal, whose origin, however, is stated to be opposite that of the anal fin.

EULAMIA SORRAH (Müller and Henle)

Carcharias (*Prionodon*) *sorrah* (Valenciennes) Müller and Henle, Syst. Beschr. Plagiostomen, p. 45, pl. 16, 1841 (type locality: Java; Madagascar; Pondicherry; India).—Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal); (Plagiost.), vol. 24, p. 39, 1852 (Batavia, Surabaja, Kammal); (Bengal), vol. 25, p. 80, 1853 (reference); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 368, 1865 (Seas of India and Madagascar).

Carcharias sorrah Günther, Cat. Fishes British Mus., vol. 8, p. 307, 1870 (Borneo).—Day, Fishes of India, pt. 4, pp. 711, 714, pl. 185, fig., 1878 (India, Mangalore, Malay Archipelago).—Perugia, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 7, p. 269, 1889 (Padang, Sumatra).—Day, Fauna British India, Fishes, vol. 1, p. 12, 1889.—Sauvage, Hist. Nat. Madagascar, Poiss., p. 501, 1891 (reference).—Bartlett, Sarawak Gazette, vol. 26, no. 366, p. 133, 1896 (Santubong).—Seale, Occ. Pap. Bishop Mus., vol. 4, no. 1, p. 4, 1906 (Shortland Island, Solomons).—Volz, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 237, 1907 (Padang and Benculen).—Günther, Journ. Mus. Godeffroy, pt. 17, p. 480, 1910 (East Indies, Solomons, Hawaii).—Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 588, 1912 (Batavia).—Pellegrin, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, no. 27, p. 2, 1912 (Singapore).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 626 (Sarawak), 1926.—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 61, 1929 (Cochinchina).

Squalus (*Carcharinus*) *sorrah* Gray, List fish British Museum, p. 47, 1851 (Singapore).

Prionodon sorrah Kner, Reise *Novara*, Fische, p. 414, 1865 (Java).

Prionodon (*Charcharias*) *sorrah* Guichenot, Mém. Soc. Sci. Cherbourg, ser. 2, vol. 2, p. 148, 1866 (Madagascar).

Carcharinus (*Prionace*) *sorrah* Bleeker, Nederland. Tijdschr. Dierk., vol. 1, p. 344, 1863 (Madagascar).

Carcharinus sorrah Garman, Mem. Mus. Comp. Zool., vol. 36, p. 132, 1913 (Indian Seas, Madagascar, Borneo, Java).—Chevey, Inst. Océanogr. Indiochine, 19ᵉ note, p. 6, 1932 (Indochine).

Eulamia sorrah Fowler, Mem. Bishop Mus., vol. 10, p. 19, pl. 1a, 1928 (Shortland Island, Honolulu, Kauai, type of *Carcharias phorcys*); Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 597, 1930 (Hongkong); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 491, 1930 (Solomons, Hawaii); Mem. Bishop Mus., vol. 11, p. 385, 1934 (reference); List Fish. Malaya, p. 9, 1938 (reference).

Carcarias taeniatus Hilgendorf, Symbol. Physic. Hemprich-Ehrenberg, Zool., p. 8, pl. 4, fig. 3, 1899 (type locality: Red Sea). (No description.)

Carcharias phorcys Jordan and Evermann, Bull. U. S. Fish Comm., vol. 22 (1902), p. 163, 1903 (type locality: Honolulu).—Jenkins, Bull. U. S. Fish Comm., vol. 22 (1902), p. 420, 1904 (Honolulu).—Snyder, Bull. U. S. Fish Comm., vol. 22 (1902), p. 513, 1904 (Honolulu; Kanalei Bay, Kauai.)—Jordan and Evermann, Bull. U. S. Fish Comm., vol. 23 (1903), pt. 1, p. 39, pl. 2, 1905 (type; Honolulu).

Carcharias marianensis Engelhardt, Zool. Anz., vol. 39, p. 647, 1912 (type locality: Guam, Marianes).

Eulamia marianensis FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 492, 1930 (compiled).

Carcharinus latistomus FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, Zool., vol. 8, p. 235, fig. 9, 1932 (type locality: Tsingtau).

Depth 4¼ to 5¼ to subcaudal origin; head 4 to 4¼, width 1⅗ to 1⅞. Snout 2 to 2⅓ in head, moderately obtuse; eye 9¼ to 11¼, 4⅗ to 6½ in snout, 5 to 5¾ in interorbital, orbital depth 1⅕ to 1⅗ in its length; dentary width 2⅖ to 3⅛ in head, length 1¼ to 1½ in its width, labial folds rudimentary or absent; teeth in 26 to 30 rows, upper rather broadly triangular with inner edges straight and outer deeply notched, lower teeth narrower, more erect, with broad bases, edges of all teeth variably finely serrated; nostrils about midway in preoral length, width 2¾ to 4¼ in internarial, front nasal valve broadly obtuse with short point; interorbital 2 to 2⅕ in head, broad, convex. Gill openings equidistant, fifth shortest and fourth and fifth above pectoral origin.

Scales minute, quindentate and with 5 keels, finely velvety to touch.

First dorsal origin opposite inner end of depressed pectoral angle, front edge 1⅖ to 1⅔ in head; second dorsal origin opposite first to last third of anal origin, front edge 2⅞ to 4⅛ in head; anal origin nearer ventral origin than subcaudal origin or midway, front edge 3 to 4 in head; subcaudal front edge 1⅔ to 2, 1⅗ to 2⅛ in its own length; least depth of caudal peduncle 4 to 5 in head; pectoral 1⅓ to 1⅘, width 1¼ to 1⅘ in its length; ventral length 2⅕ to 2⅔; claspers small, narrowly attenuated, pointed, not reaching hind ends of ventrals.

Body gray-brown above, whitish below. Fins more or less grayish terminally. Sometimes subcaudal lobe with terminal blackish blotch.

Madagascar, India, Singapore, East Indies, Philippines, Indo-China, China, Melanesia, Hawaii. Known chiefly by the second dorsal smaller than the anal with its insertion further back and its broad pectorals. Along side of head eyes in pale or whitish extending from lower surfaces, also all around edge of snout. Its caudal is very long, equals or exceeds interdorsal space or 2¼ in rest of body.

The nominal *Carcharinus latistomus* Fang and Wang is largely in agreement with the present species, having been based on a specimen 565 mm. in length. It seems to differ only in the shorter and more convexly rounded snout; also the broad mouth is shown a little greater at the angles than the preoral length. The edges of the lower teeth are not described. The profile figure shows the large first dorsal advanced over the pectoral base, and the anal origin slightly before that of the second dorsal, though both of these fins rather large or about long as snout. Though the gill openings are said to be subequal they are shown with the first longest and the others graduated shorter to the last or most posterior.

The figure of *Carcarias taeniatus* Hilgendorf agrees in so many ways with the present species that I think it was intended for it. Though only one broad serrated tooth is shown it may have been intended for both jaws. The scales are shown as rounded, though with 4 or 5 parallel keels.

Carcharias marianensis Engelhardt is too briefly noticed for positive identification. It is said to have a broadly rounded snout, pectoral long as head, both dorsals and ventrals angularly pointed, first dorsal and anal with black apical blotch. Length, 400 mm.

6705. San Roque market. December 1, 1908. Length, 740 mm.
U.S.N.M. No. 32708. Indian Archipelago. Leiden Museum. Length, 590 mm.
U.S.N.M. No. 72477. Batavia, Java. Bryant and Palmer. Length, 580 mm.
U.S.N.M. No. 72478. Batavia. Bryant and Palmer. Length, 600 mm.
U.S.N.M. No. 72479. Batavia. Bryant and Palmer. Length, 420 mm.

Subgenus PLATYPODON Gill

EULAMIA MELANOPTERA (Quoy and Gaimard)

Carcharias melanopterus QUOY and GAIMARD, Voy. *Uranie*, Zool., pts. 5–6, p. 194, pl. 43, figs. 1–2, 1824 (type locality: Waigiu; Marianes).—BENNETT, Life of Raffles, p. 694, 1830 (Sumatra).—RÜPPELL, Neue Wirbelth., Fische, p. 63, 1835 (Red Sea).—GÜNTHER, Fishes of Zanzibar, p. 142, 1866 (Aden).—SCHMELTZ, Cat. Mus. Godeffroy, No. 4, p. 28, 1869 (Kandavu).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 369, 1870 (South Africa, Amboyna).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 218, 1871 (Red Sea).—PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p. 853 (New Ireland).—STREETS, U. S. Nat. Mus. Bull. 7, p. 94, 1877 (Christmas and Washington Islands, Fanning Group).—DAY, Fishes of India, pt. 4, p. 715, pl. 185, fig. 3, 1878 (India, Andamans, Malay Archipelago).—PETERS, Monatsb. Akad. Wiss. Berlin, 1880, p. 1035 (Hong Kong).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 352, 1881 (Torres Strait, Port Darwin).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 48, 1885 (Macassar).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 2, 1888 (Ugi, Solomon Islands); Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1768, 1888 (Torres Straits and Port Darwin).—BRUSINA, Glasnik Naravosl. Družtva, vol. 3, p. 223, 1888 (Red Sea).—DAY, Fauna Brit. India, vol. 1, p. 14, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 42, 1890 (Hobsons Bay).—SNYDER, Bull. U. S. Fish Comm., vol. 22 (1902), p. 513, 1904 (Honolulu).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), pt. 1, p. 38, pl. 1, 1905 (Honolulu; Samoa).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 237, 1907 (Sumatra?).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 480, 1910 (Indo-Pacific; Hawaii).—KENDALL and GOLDSBOROUGH, Mem. Mus. Comp. Zool., vol. 26, p. 242, 1911 (Fakarava, Paumotus).—PELLEGRIN, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 2, 1912 (Red Sea; Assab).—ZUGMAYER, Abh. Bayer. Akad. Miss., math.-phys. Kl., vol. 26, p. 8 (Mekran and Oman), p. 17, 1913.—MCCULLOCH, Rec. Australian Mus., vol. 9, pt. 3, p. 356, 1913 (Murray Island, Queensland).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6e note, p. 61, 1929 (Cochinchina).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 350, 1929 (Travancore).

Carcharias (*Prionodon*) *melanopterus* Müller and Henle, Syst. Beschr. Plagiost., p. 43, pl. 19, fig. 5, 1841 (Waigiu).—Richardson, Ichth. China Japan, p. 146, 1846 (China Sea).—Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal); (Plagiost.), vol. 24, p. 33, 1852 (Batavia, Samarang, Surabaya, Kammal); (Japan), vol. 25, p. 21, 1853 (Japan, China, East Indies); Nat. Tijds. Nederland. Indië, vol. 8, p. 393, 1855 (Amboina); Act. Soc. Sci. Indo-Néerl., vol. 1, No. 3, p. 6, 1856 (Manado); vol. 2, No. 7, p. 9, 1857 (Amboina); Verh. Batav. Genootsch. (Japan), vol. 26, p. 42, 1857 (Japan); Act. Soc. Sci. Indo-Néerl., vol. 6, No. 2, p. 3, 1859 (Doreh, New Guinea): Nat. Tijds. Nederland. Indië, vol. 22, p. 110, 1860 (Buru); Versl. Meded. Akad. Wet Amsterdam, vol 12, p. 30, 1861 (Singapore); Nederland. Tijdschr. Dierk., vol. 1, p. 240, 1863 (Obi Island).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 365, 1865 (types).—Schmeltz, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Viti Islands); No. 7, p. 64, 1879 (Viti Islands).—Steindachner, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 70, p. 519, 1901 (South Sea); vol. 71, pt. 1, p. 160, 1907 (Tamarida).—Weber, *Siboga* Exped., Fische, vol. 57, p. 590, 1913 (Makassar; Aru Islands).

Carcharias (*Prionace*) *melanopterus* Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1382, 1849 (Straits of Malacca).—Bleeker, Nederland. Tijdschr. Dierk., vol. 1, p. 264, 1863 (Atapupu, Timor).

Charcharius melanopterus Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 217, 1872 (Hobsons Bay). (Error.)

Squalus (*Carcharinus*) *melanopterus* Gray, List fish British Mus., p. 46 1851 (Cape Seas, Moluccas, Port Arthur, China, South Australia).—Blyth, Journ. Asiat. Soc. Bengal, vol. 29, p. 36, 1860 (Calcutta).

Squalus melanopterus Jouan, Mém. Soc. Imp. Sci. Nat. Cherbourg, vol. 8, p. 245, 1861 (Dumbea, New Caledonia).

Prionodon melanopterus Day, Fishes of Malabar, p. 269, 1865.—Kner, Reise *Novara*. Fische, p. 415, 1865 (Java).

Carcharhinus melanopterus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 38, 1901 (Nagasaki).—Ogilby, Mem. Queensland Mus., vol. 5, p. 81, 1916 (Moreton Bay; Northwest Islet; Darnley Island).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—Whitley, Journ. Pan-Pacific Res. Inst., vol. 2, no. 1, p. 3, 1927 (Fiji).—Umali, Philippine Dept. Agr. Comm. Pop. Bull. 6, p. 37, 1936 (Manila).—Roxas and Martin, Dept. Agr. Comm. Manila Techn. Bull. 6. p. 13, 1937 (reference).

Carcharinus melanopterus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 134, 1913 (Apiang, Kingsmills).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 24, 1925 (Natal coast).—Chevey, Inst. Oceanogr. Indochine, 19^e note, p. 6, 1932 (Indochina).—Giltay, Mem. Mus. Roy. Nat. Hist. Belg., Hors ser. 5, vol. 3, p. 10, 1933 (Dobo, Aru Island).—Tortonese, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 44, p. 4, 1934 (Persia); ser. 3, vol. 45, p. 9, 1935–36 (Mar Rosso).—Herre, Mid-Pacific Mag., vol. 16, no. 2, p. 163, April–June 1935 (Pelew Islands).

Carcharinus (*Prionodon*) *melanopterus* Suvatti, Index Fish. Siam, p. 2, 1937 (Ko Tau; Maenam Cau Phya; Sattahip).

Eulamia melanopterus Fowler, Bishop Mus. Bull. 22, p. 4, 1925 (Guam); Bull. 38, p. 3, 1927 (Christmas Island, Fanning Group); Mem. Bishop Mus., vol. 10, p. 20, 1928 (Palmyra Island, Honolulu, Apiang, Tuamotus, Hanalei Bay, Fakarava, Solomons, Thornton and Fanning Islands, Guam); Hong Kong Nat., vol. 1, p. 81, 1930 (China); Mem. Bishop Mus., vol. 11, no. 5, p. 314

1931 (reference); vol. 11, no. 6, p. 384, 1934 (Solomons; Ellice Islands); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 52, 1936 (Hawaii; Polynesia); List Fish. Malaya, p. 9, 1938 (reference).

Eulamia melanoptera FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 492, 1930 (Solomons, Kingsmills, Japan, Guam, Palmyra, Paumotus, Thornton Island, Hawaii).

Carcharias (*Prionodon*) *henlei* (not Valenciennes) BLEEKER, Nat. Tijds. Nederland. Indië, vol. 4, p. 507, 1853 (Batavia, Java).

Carcharias (*Prionodon*) *brachyrhynchos* BLEEKER, Act. Soc. Sci. Indo-Néerland., (Enumerat.), vol. 6, p. 206, 1859.—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 364, 1865 (compiled).

Carcharias elegans (Ehrenberg) KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 658, 1871 (name in synonymy).—HILGENDORF, Symbol. Physic. Hemprich-Ehrenberg, p. 7, pl. 4, fig. 2, 1899 (type locality: Red Sea).

Carcharias hemiodon (part) MACLEAY, Proc. Linn. Soc. New South Wales, vol. 2, p. 366, 1878 (Port Darwin; "a large one with the tips of all the fins quite black").

Depth 5 to 5⅔ to subcaudal origin; head 3⅔ to 3⅘, width 1¼ to 1¾. Snout 2⅕ to 2½ in head, broadly rounded as viewed above; eye 7½ to 13⅘, 3 to 5 in snout, 4⅛ to 8 in interorbital; orbit with depth 1¼ to 1½ its length; dentary width 2⅛ to 2⅞ in head, labial grooves very short or simply as very short rudimentary fold just above angle; teeth in about 26 to 28 rows in jaws, bases broad, upper cusps broadly triangular with ends slightly attenuated, inner edge obliquely straight and outer deeply notched; lower cusps more erect, narrower, edges nearly or quite smooth in young; teeth all more or less finely serrate with age; nostrils slightly nearer snout tip than mouth, width of aperture 3⅞ in internarial, front valve broad and obtuse flap with short point; interorbital 1⅔ to 2 in head, broad, slightly convex. Gill openings 5, equidistant, subequal, last 2 above pectoral base.

Scales very small, tridentate, with 3 to 5 keels.

First dorsal origin opposite inner end of depressed pectoral angle, front edge 1¼ to 1⅖ in head; second dorsal origin opposite anal origin, variably slightly forward or backward, front edge 2⅔ to 4⅔ in head; anal origin nearer subcaudal origin than that of ventral, front edge 3 to 4 in head; subcaudal front edge 1⅖ to 1⅗, 1½ to 1¾ in its own length; least depth of caudal peduncle 4⅘ to 5⅗ in head; pectoral 1 to 1⅓, width 1⅔ to 1⅞ in its length; ventral length 1⅘ in head; claspers short and slender, none quite reaching hind ventral ends.

Back fawn to warm brown, under surfaces white. First dorsal with large black apical blotch, smaller one at apex of second dorsal. Anal with black blotch. Subcaudal lobe black apically and fin otherwise narrowly edged blackish. Pectoral with black apical blotch. Margin of ventral rather narrowly blackish apically. In small examples black apical blotches less pronounced or merely fin edge blackish, except caudal which colored as in adults.

Red Sea, Arabia, South Africa, Natal, India, Andamans, Singapore, East Indies, Philippines, Indo China, China, Japan, Northern Territory Australia, Queensland, South Australia, Victoria, Melanesia, Micronesia, Polynesia, Hawaii. One in the Queensland Museum from Darnley Island and another from Brisbane, also male and female foetus. I2566 and 2567 from Piper Island, Mr. Brown.

9051, 9052. Abuyog, Leyte. July 16, 1909. Length, 500 to 563 mm. Second dorsal without black apical spot.

7876. Cayagan, Jolo. January 8, 1909. Length, 566 mm. Of fins only first dorsal with black apical blotch and outer ⅔ of subcaudal lobe blackish.

U.S.N.M. No. 32707. Indian Archipelago. Length, 470 mm.

U.S.N.M. No. 40007. Solomon Islands. Australian Museum. Length, 340 to 342 mm. 2 examples.

U.S.N.M. No. 52643. Hawaiian Islands. Bureau of Fisheries (03872). Length, 617 mm.

U.S.N.M. No. 65783. Fakarava, Paumotus. *Albatross* collection. Length, 1,100 mm. In this example the claspers extend far beyond the ventrals, 1½ in head, pointed, robust, strong, with broad, flat terminal lamina. Tips of paired fins narrowly blackish.

U.S.N.M. No. 51205. Hawaii. U. S. Fish Commission. Length, 890 mm.

U.S.N.M. No. 51214. Hawaii. U. S. Fish Commission. Length, 770 mm.

U.S.N.M. No. 62482. Hanelei Bay, Hawaii. Bureau of Fisheries. Length, 780 mm.

U.S.N.M. No. 62483. Honolulu. Bureau of Fisheries. Length, 680 mm.

EULAMIA MENISORRAH (Müller and Henle)

Carcharias (*Prionodon*) *menisorrah* (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 46, p. 17, 1841 (type locality: Java; Australia; Red Sea).—BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 1, p. 160, 1851 (Banka); vol. 3, p. 446 (Banka), p. 717 (Paukalpinang, Banka) 1852; Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 35, pl. 1, fig. 3, 1852 (Batavia and Samarang); Nat. Tijdschr. Nederland. Indië, vol. 12, p. 218, 1856 (Nias); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 369, 1865 (type).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Sinkawang in Borneo).

Carcharias menisorrah GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 371, 1870 (Moluccas and Batavia).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 660, 1871 (Red Sea).—DAY, Fishes of India, pt. 4, p. 716, pl. 184, fig. 1, 1878 (Red Sea, Malay Archipelago, Calicut).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 2, 1888 (Calicut, type of *Carcharias malabaricus* Day; Port Moresby, New Guinea); Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1768, 1888 (south coast of New Guinea).—BRUSINA, Glasnik Naravosl. Družtva, vol. 3, p. 224, 1888 (Red Sea).—DAY, Fauna British India, Fishes, vol. 1, p. 16, 1889.—BOULENGER, Proc. Zool. Soc. London, p. 243, 1889 (Muscat).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran and Oman).—CLARK, Rep. Sci. Res. *Scotia*, Scot. Nat. Antarct. Exped., vol. 4, p. 398, fig., 1915 (St. Pauls Rocks).—BORODIN, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (Red Sea).

Carcharias menisorah Tirant, Service Océanogr. Pêches Indo-Chine, 6e note, p. 61, 1929 (Indochina).

Carcharhinus menisorrah Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang).—Waite, Rec. Australian Mus., vol. 5, pt. 3, p. 140, 1904 (Lord Howe Island).—Roxas and Martin, Dept. Agr. Comm. Manila, Techn. Bull. 6, p. 13, 1937 (reference).

Carcharinus menisorrah Garman, Mem. Mus. Comp. Zool., vol. 36, p. 135, 1913 (Pinang).—Chevey, Inst. Océanogr. Indochine, 19e note, p. 6, 1932 (Indochina).—Herre, Fishes Herre Philippine Exped. 1931, p. 12, 1934 (Cebu).

Eulamia menisorrah Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 65 (Padang example); Mem. Bishop Mus., vol. 10, p. 20, 1928 (Port Moresby, New Guinea); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 492, 1930 (East Indies, New Guinea); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference); vol. 11, No. 6, p. 385, 1934 (Port Moresby, New Guinea); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p 52, 1936 (Sumatra); List Fish. Malaya, p. 9, 1938 (reference).

Platypodon menisorrah Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Carcharias (Prionodon) tjutjot Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, pp. 28, 36, pl. 1, fig. 4, 1852 (head) (type locality: Batavia).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 371, 1865 (compiled).

Carcharias tjutjot Pietschmann, Sitz. Ber Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 683, figs. 7–8, 1908 (teeth) (Japan).

Carcharias pharaonis (Ehrenberg) Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 660, 1871 (name is synonymy).

Gymnorhinus pharaonis Hilgendorf, Symbol. Physic. Hemprich-Ehrenberg, p. 8, pl. 7, fig. 1, 1899 (type locality: Red Sea).

Carcharias malabaricus Day, Journ. Linn. Soc. London, vol. 10, Zool., p. 529, 1873 (type locality: Palliport near Cochin and Calicut on Malabar coast).

Carcharhinus cerdale (Gilbert) Jordan and Evermann, U. S. Nat. Mus. Bull. 47, vol. 3, p. 2746, 1898 (type locality: Panama).

Carcharias cerdale Gilbert and Starks, Mem. California Acad. Sci., vol. 4, p. 10, pl. 2, fig. 4, 1903.

Carcharhinus natator Meek and Hildebrand, Field Mus. Publ., No. 215, zool. ser., vol. 15, pt. 1, p. 40, pl. 1, fig. 1, 1923 (type locality: Panama City).

Eulamia natator Fowler, Proc. 4th (1929) Pacific Sci. Congr. Java, p. 492, 1930 (compiled).

Depth 5⅕ to 6¾ to subcaudal origin; head 3⅖ to 3⅔, width 1⅗ to 1⅔. Snout 2¼ to 2⅓ in head, obtusely pointed; eye 7 to 11, 3 to 4⅗ in snout, 3⅖ to 6 in interorbital; orbital depth 1⅕ to 1¼ in its length; dentary width 2½ to 2⅗ in head, length ⅔ its width; labial fold only as very short groove before mouth angle on upper jaw; teeth in 24 or 25 rows in jaws, with broad bases; upper cusps broadly triangular, outer edge notched and serrae coarser basally, especially on basal part of outer marginal notch; lower cusps narrowly lanceolate, nearly or quite entire and erect; nostrils slightly nearer mouth than snout tip, length of aperture 3⅘ in internarial, front valve 1⅞ broad obtuse triangular flap; interorbital 2 in head, broad, surface moderately convex. Gill openings about equidistant, fourth longest, fourth and fifth above pectoral origin.

Scales minute, quindentate, and with 4 or 5 keels.

First dorsal origin opposite hind inner angle of depressed pectoral fin; front edge 1⅖ to 1⅗ in head; second dorsal origin opposite that of anal, front edge 3⅗ to 4⅔ in head; anal origin nearer subcaudal origin than that of ventral, front edge 3⅕ to 3¼ in head; front subcaudal edge 1⅖ to 1⅗, 1⅗ to 1¾ in its own length; least depth of caudal peduncle 5⅘ to 6⅛ in head; pectoral 1⅛ to 1⅕, width 2 to 2⅛ in its length; ventral length 2⅞ to 3 in head; claspers narrow, short, pointed, not reaching hind ventral ends.

Brown above, whitish below. Dorsals and caudal like back, also anal and upper surfaces of paired fins. Lower terminal portions of pectorals blackish, of ventrals brownish. Outer half of subcaudal lobe dusky brown.

Red Sea, Arabia, India, Singapore, East Indies, Indo China, Philippines, Australia, Lord Howe Island. Also at Panama. Allied with *Eulamia spallanzani*, *E. dussumieri* and *E. pleurotaenia* in the second dorsal and anal subequal and their origins opposed. I feel my examples are the present species, rather than *E. spallanzani* though Garman gives for the latter "pectorals twice as long as wide" and for *E. dussumieri* "pectorals less than twice as long as broad." Müller and Henle also show for the latter the pectoral width 1⅘ its length and Day's figure shows its width half its length. Possibly *Squalus spallanzani* Lesueur may be the present species.

7895. Off Luzon Point, Manila Bay. January 31, 1909. Length, 670 mm.
7911. Off Luzon Point. February 7, 1909. Length, 627 mm.
U.S.N.M. No. 39991. Port Moresby, New Guinea. Australian Museum. Length, 610 mm.
A.N.S.P. No. 27297. Padang, Sumatra. A. C. Harrison and H. L. Hiller.

EULAMIA SPALLANZANI (Lesueur)

Squalus spallanzani Lesueur, Journ. Acad. Nat. Sci. Philadelphia, vol. 2, pt. 2, p. 351, 1822 (type locality: Terre de Witt, New Holland).

Carcharinus spallanzani Garman, Mem. Mus. Comp. Zool., vol. 36, p. 136, 1913 (Indian Ocean).

Eulamia spallanzani Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 492, 1930 (reference).

Mapolamia spallanzani Whitley, Mem. Queensland Mus., vol. 10, pt. 4, pp. 189, 198, 1934 (reference).

Carcharias (*Prionodon*) *bleekeri* Duméril, Hist. Nat. Elasmobr., vol. 1, p. 367, 1865 (type locality: Pondicherry).

Carcharias bleekeri Günther, Cat. Fishes British Mus., vol. 8, p. 370, 1870 (Seychelles).—Day, Fishes of India, pt. 4, p. 715, 1878 (Seychelles example); Fauna British India, Fishes, vol. 1, p. 15, 1889.—Bamber, Journ. Linn. Soc. London, vol. 31, Zool., p. 38, 1915 (Sudanese Red Sea).

Snout moderately produced; teeth in 25 rows above, 23 below, finely serrated, upper oblique with inner edge straight and outer notched, narrow lower teeth nearly erect on broad bases; nostrils nearly midway in preoral.

First dorsal origin short space behind inner hind pectoral angle; second dorsal opposite, long as but lower than anal, extended in long lobe posteriorly; pectoral falciform, upper margin 5 times long as lower.

Deep black spot at lower side end of pectoral. End of subcaudal with deep black spot. No spot on first dorsal. (Günther.)

Red Sea, Seychelles, India. This species is imperfectly known. Günther's specimen, described above is estimated by Day to have been 1,220 mm. long and Duméril's 2 types of *Carcharias* (*Prionodon*) *bleekeri* 310 and 780 mm.

The brief notice of the original account of this species is as follows: Head very much depressed. No spiracles. A lunulated emargination above and another beneath the tail. Caudal fin undulated above. Pectorals falciform, very narrow, situated under 2 last gill openings. Black spot at end of pectorals, another at summit of second dorsal and third at end of subcaudal. Inhabits Terre de Witt, New Holland.

EULAMIA DUSSUMIERI (Müller and Henle)

Carcharias (*Prionodon*) *dussumieri* (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 47, pl. 19, fig. 8, 1841 (type locality: China; Bombay; Pondicherry).—RICHARDSON, Ichth. China Japan, p. 194, 1846 (China Sea, Canton).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 370, 1865 (types, Bombay, Pondicherry).

Carcharias dussumieri GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 367, 1870 (Batavia).—DAY, Fishes of India, pt. 4, p. 714, pl. 187, fig. 2, 1878 (India, Malay Archipelago, Malabar).—OGILBY, Cat. Fishes, Australian Mus., pt. 1, p. 2, 1888 (Salangore, Straits Settlements).—DAY, Fauna Brit. India, Fishes, vol. 1, p. 13, 1889.—BARTLETT, Sarawak Gaz., vol. 26, No. 366, p. 133, 1896 (Moratabas).—VOLZ, Nat. Tijdschr. Nederland, Indië, vol. 66, p. 237, 1907 (Padang).—SOUTHWELL, Ceylon Administr. Rep. 1912–13, p. E49.—ZUGMAYER, Abh. Bayer, Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10 p. 627, 1926 (Sarawak).—TIRANT, Service Océanogr. pêches Indo-Chine, 6^e note, p. 61, 1929 (Cochinchina).—CHEVEY, Inst. Océanogr. Indochine, 19^e note, p. 6, 1932 (Indochina).—HERRE, Journ. Pan-Pac. Res. Inst., vol. 8, no. 4, p. 6, 1933 (Dumaguete); Fish. Herre Philippine Exped., 1931, p. 12, 1934 (Dumaguete).

Squalus (*Carcharinus*) *dussumieri* GRAY, List fish British Museum, p. 47, 1851 (reference).

Pionodon dussumieri KNER, Reise *Novara*, Fische, p. 414, 1865 (Java).

Carcharinus dussumieri GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 137, 1913 (China, India, East Indies).—BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 1012, 1927 (copied).

Eulamia dussumieri FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 190 (Delagoa Bay); Hong Kong Nat., vol. 1, p. 82, fig. 10, 1930 (China); Proc.

4th (1929) Pacific Sci. Congr., Java, p. 492, 1930 (Indian Ocean); List Fish. Malaya, p. 8, 1938 (reference).

? *Carcharias javanica* VAN HASSELT, Algemein, Konst. Letterbode, May 1823, p. — (type locality: Java); Bull. Sci. Nat. Férussac, vol. 2, p. 89, 1824 (Java).

Carcharias (*Prionodon*) *javanicus* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, pp. 28, 38, pl. 2, fig. 5, 1852 (Batavia); Nat. Tijdschr. Nederland. Indië, vol. 9, p. 395, 1855 (Pasuruan); Act. Soc. Sci. Ind. Néerland., vol. 1, No. 3, p. 10, 1856 (Macassar); Nat. Tijdschr. Nederland. Indië, vol. 13, p. 58, 1857 (Kajeli, Buru); Act. Soc. Sci. Ind. Néerland., vol. 3, No. 6, p. 2, 1858 (Sinkawang, Borneo).—DUMÉRIL, Hist. Nat. Elasmobranchs, vol. 1, p. 369, 1865 (compiled).

Depth 4¾ to 6⅕ to subcaudal lobe origin; head 3¾ to 4⅖, width 1½ to 1¾. Snout 2¼ to 2⅓ in head, obtusely rounded as viewed from above; eye 8 to 10, 4⅕ to 4½ in snout, 5 to 5⅖ in interorbital; orbital depth 1⅕ to 1⅖ in its length; dentary width 2⅔ to 3 in head, length 1¼ to 1⅖ in its width, with only very slight or rudimentary fold at angle; teeth in 24 or 25 rows in jaws, serrated, upper triangular with attenuated cusps, inner edge slightly undulate to straight and outer deeply notched, all cusps well inclined toward sides of jaws, lower erect with narrow slender cusps on wide bases and edges serrated to tips; nostrils midway in preoral length, aperture width 3 in internarial front valve as triangular flap; interorbital 2 in head, broad, slightly convex. Gill openings equidistant, last shortest and fourth and fifth above pectoral base.

Scales minute, tridentate to quindentate, with as many keels, finely velvety to touch.

First dorsal origin opposite hind inner angle of depressed ventral, front edge 1⅛ to 1½ in head; second dorsal origin opposite that of anal, front edge 3 to 4⅖ in head; anal subequal with second dorsal, origin little nearer subcaudal than ventral origin, front edge 2⅔ to 3⅘ in head; subcaudal front edge 1⅖ to $1\frac{9}{10}$, 1⅗ to 2 in rest of fin; least depth of caudal peduncle 5 to 5¼ in head; pectoral 1 to 1⅖, width 1⅗ to 2 in its length; ventral length 2 to 2⅗ in head; claspers short, attenuate, not extending back far as hind ventral edges.

Back gray or fawn color, under surfaces whitish. Fins all more or less with uniform grayish, edges pale or whitish all around on most all. White on side of head extends up till level with upper edge of eye.

Portuguese East Africa, Arabian Sea, India, Ceylon, Malay Peninsula, East Indies, Philippines, Indo-China, China. Known by its uniformly pale fins or margined whitish. Its general appearance slender, with rather obtuse snout.

9319. Cebu market. August 16, 1909. Length, 687 mm. Second dorsal with hind lobe lost.

U.S.N.M. No. 6457. Hongkong. William Stimpson. Length, 357 mm.

EULAMIA PLEUROTAENIA (Bleeker)

FIGURE 8

Carcharias (Prionodon) pleurotaenia BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, pp. 28, 40, pl. 2, fig. 6, 1852 (head) (type locality: Batavia); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 377, 1865 (Batavia).

Carcharinus pleurotaenia GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 137, 1913 (Java).

Eulamia pleurotaenia FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference); List Fish. Malaya, p. 9, 1938 (reference).

Depth 4 to subcaudal origin; head 3⅔ to 3⅞, width 1⅔ to 1⅗. Snout 2⅓ to 2½ in head, broadly rounded as viewed from above; eye 10 or 11, 4⅕ to 4½ in snout, 5¾ to 7 in interorbital; orbit slightly deeper than long; dentary width 2⅕ to 2⅖ in head, wide, length 1⅗ to 1¾ in its width, very short fold above angle on upper jaw; teeth in 24 to 26 rows, upper with rather moderate triangular cusps and lower more erect and slenderly lanceolate, all minutely serrate, with serrae coarser basally; nostrils slightly nearer mouth than snout tip, width of aperture 4 to 4¼ in internarial space, front valve broad, short, obtuse flap; interorbital 1⅘ to 2 in head, broadly convex. Gill openings nearly equidistant, last shortest, fourth and fifth above pectoral base.

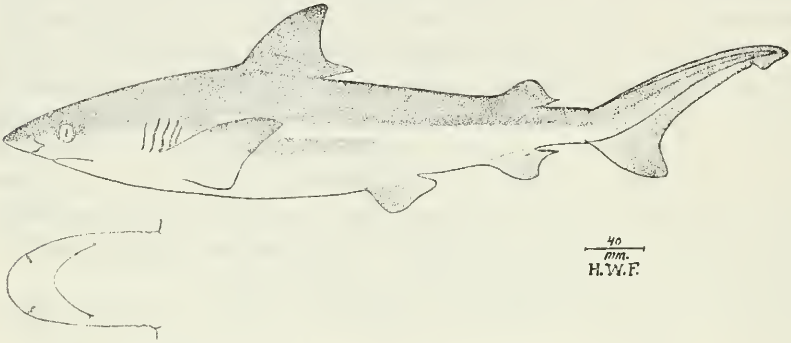

FIGURE 8.—*Eulamia pleurotaenia* (Bleeker): Manila.

Scales minute, quindentate, and with as many keels.

First dorsal origin opposite hind basal end of depressed pectoral, front edge 1⅓ to 1⅖ in head; second dorsal opposite anal, origins opposed, front edge 4 to 4⅕ in head; anal origin midway between ventrals and subcaudal origins, front edge 3⅖ to 3½ in head; subcaudal front edge 1⅔ to 1¾, 1⅘ to 1⅞ in its own length; least depth of caudal peduncle 4⅕ to 4½ in head; pectoral 1⅛ to 1¼, width 1¾ to 2 in its length; ventral length 2½ to 2⅗ in head; claspers small, slender, pointed, not reaching hind ventral edge.

Brown above, whitish on under surface. Indistinct pale longitudinal band, imperfectly defined or diffuse, along sides of body medianly from above pectoral until above ventrals. Fins all more or less brownish terminally, and on lower surfaces of paired ones grayish. Ends of dorsals, pectorals, and subcaudal dusky to blackish. Whitish of lower surface of head extends up to include eye or till level with its upper edge and narrowly all around snout margin.

Singapore, East Indies, Philippines. This species seems to differ from *Eulamia dussumieri* chiefly in the pale lateral band on the flanks, slightly longer caudal, which nearly to almost equals space between origins of two dorsal fins. In my specimens the pectorals do not reach beyond the end of the first dorsal, as claimed by Garman. Also my examples show the anal a little larger than the second dorsal. Its body is deep and plump.

6762. Manila market. April 21, 1909. Length, 520 mm.

U.S.N.M. No. 32705. Indian Archipelago. Royal Museum Leiden. Length, 533 mm.

EULAMIA TEPHRODES (Fowler)

Carcharinus tephrodes Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 455, fig. 1 (type locality: Baram, Borneo).

Eulamia tephrodes Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (type).

? *Carcharias (Prionodon) borneensis* Bleeker, Act. Soc. Sci. Indo-Néerl. (Borneo), vol. 5, p. (2) 8, 1859 (type locality: Sinkawang, Borneo) (fetus).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 378, 1865 (compiled).

Carcharias borneensis Günther, Cat. Fishes British Mus., vol. 8, p. 371, 1870 (compiled).—Elera, Cat. Fauna Filip., vol. 1, p. 614, 1895 (Samar, Borongan).—Bartlett, Sarawak Gazette, vol. 26, no. 366, p. 133, 1896 (compiled).—Fowler, Science, new ser., vol. 33, p. 748, 1911 (notes Seale's name as preoccupied).—Giltay, Mem. Mus. Roy. Nat. Hist. Belg., Hors ser. 5, vol. 3, p. 11, fig. 2, 1933 (teeth) (Samarang, Java).

Charcharias borneensis Seale, Philippine Journ. Sci., vol. 5, p. 263, pl. 1, figs. 1-4, 1910 (Sandakan, Borneo). (As a new species.)

Carcharias sealei Pietschmann, Jahrb. Verh. Naturh. Wiesbaden, 1916, p. 172, pl. 1 (on Seale).

Eulamia sealei Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 492, 1930 (compiled).

Depth 5⅖ to subcaudal origin; head 3⅓, width 1½. Snout 2¼ in head; eye 11⅔, 5 in snout, 7⅔ in interorbital; mouth width 2⅓, each corner with short fold which extends obliquely outward; upper teeth broad, triangular, edges finely serrated; lower teeth entire, long, slender; nostrils close behind middle of preoral length, about equal eye, oblique, each with small pointed flap; interorbital 2 in head. Three median gill openings largest, last 2 over pectoral base.

First dorsal origin over hind base of pectoral, front fin edge 1⅗ in head; second dorsal origin slightly behind anal origin, front fin edge 1⅘ in head; anal little smaller than second dorsal, front fin edge 2¼; least depth of caudal peduncle 4¾; caudal 2½ in rest of body; subcaudal 2¾ in caudal length; pectoral 1¼ in head, width 1⅕ in its length; ventral length 1⅘ in head, obtuse.

Uniform gray above and on fins, below white. Lower surfaces of pectorals and ventrals white. Caudal gray, paler along lower part of vertebral column.

Borneo. Reported from Samar and Borongan by Elera.

2 examples. A.N.S.P. Baram, Borneo. 1897. A. C. Harrison and H. M. Hiller. Length, 367 to 622 mm. Type and paratype of *Carcharinus tephrodes*.

Subgenus Eulamia Gill

EULAMIA GANGETICA (Müller and Henle)

Carcharias (Prionodon) gangeticus Müller and Henle, Syst. Beschr. Plagiostomen, p. 39, pl. 13, 1841 (type locality: Ganges, 60 hours above the sea at Hoogly).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 359, 1865 (Bengal).—Steindachner, Denkschr. Akad. Wiss. Wien, math-nat. Kl., vol. 70, p. 519, 1901 (Laysan).

Carcharias gangeticus Günther, Cat. Fishes British Mus., vol. 8, p. 367, 1870 (Calcutta and Viti Levu, Fiji).—Day, Fishes of India, pt. 4, p. 715, pl. 187, fig. 1, 1878 (India; Japan).—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).—Peters, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 352, 1881 (Port Jackson).—Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1768, 1888 (Port Jackson).—Day, Fauna Brit. India, vol. 1, p. 13, 1889.—Boulenger, Proc. Zool. Soc. London, p. 243, 1889 (Muscat).—Bartlett, Sarawak Gazette, vol. 26, no. 366, p. 133, 1896 (Moratabas).—Lloyd, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—Günther, Journ. Mus. Godeffroy, pt. 17, p. 479, 1910 (Indian Ocean, Indian Archipelago, Tigris River to Bagdad, Viti Levu).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—Tirant, Service Océanogr. Pêches Indochine, 6ᵉ note, p. 61, 1929 (Saigon, Cholon, Cochinchina).

Squalus (Carcharinus) gangeticus Gray, List fish British Museum, p. 45, 1851 (Calcutta).—Blyth, Journ. Asiat. Soc. Bengal, vol. 29, p. 36, 1860 (Calcutta).

Carcharhinus gangeticus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 38, 1901 ("Japan").—McCulloch, Fishes New South Wales, ed. 2, p. 5, 1927.—Herre, Philippine Journ. Sci., vol. 34, p. 303, 1927 (Mindoro, Lake Naujan).—Tanaka, Jap. Fish. Life Colours, no. 26, 1933.—Roxas and Martin, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 13, 1937 (reference).

Carcharinus gangeticus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 139, 1913 (India; Fiji; Japan).—Waite, Rec. South Australian Mus., vol. 2, p. 11, fig. 7, 1921.—Chevey, Inst. Océanogr. Indochine, 19ᵉ note, p. 6, 1932 (Indo China).

Eulamia gangeticus Fowler, Mem. Bishop Mus., vol. 10, p. 20, 1928 (compiled); Hong Kong Nat., vol. 1, p. 82, 1930 (China).

Eulamia gangetica Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).

Platypodon gangeticus WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

? *Squalus carcharias* (not Linnaeus) BUCHANAN-HAMILTON, Fishes of Ganges, p. 4 (361), 1822 (Ganges River).

Carcharias (*Prionodon*) *japonicus* SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 302, pl. 133, 1850 (type locality: Japan).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 25, p. 21, 1853 (Japan); (Japan), vol. 26, p. 42, 1857 (Japan).

Carcharias japonicus JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p, 614, 1903 (Hakodate, Tokyo, Wakanoura, Kawatana, Nagasaki).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 9, 1930 (Far East Seas).

Prionace japonica JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 39, 1901 (Nagasaki).

Eulamia japonica FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 590, 1930 (Tokyo market).

Carcharinus japonicus FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 233, fig. 8, 1932 (Tsingtau).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 92, 1933 (Chusan).

Depth 6 to subcaudal origin; head 4, width 1½. Snout 2$\frac{9}{10}$ in head, bluntly rounded as seen from above; eye 24, 8 in snout, 14 in interorbital; mouth width 1⅔ in head, length half its width, very short labial fold at angles; preoral length 2¼ in mouth width or 4⅛ in head; teeth in 27 to 31 rows, subtriangular, serrated, broad upper ones slightly inclined in front more so toward mouth angles and outer teeth with more indented outer edge; lower erect teeth narrower, bases wide, edges serrated and deeply indented above base with prominence at side of notch in some, median teeth small; nostrils close below snout edge, about opposite last third in preoral length, front lobe triangular point, internarial 1⅔ in mouth width; interorbital 1⅔ in head, low. Gill openings equidistant, first longest, last 2 over pectoral and smallest.

Scales minute, quindentate, each with 3 or 4 keels.

First dorsal begins opposite last fifth of pectoral base, front fin edge 1⅓ in head; front edge of second dorsal 2¾; anal origin slightly behind first dorsal origin, front fin edge 3⅞ in head; least depth of caudal peduncle 4¾; ventral length 2¼, conic or attenuate clasper ¾ to anal; caudal 2⅗ in rest of body, subcaudal 1½ in head or 2⅖ in caudal; pectoral 3⅗ in body to subcaudal origin, width 1⅞ its length which 1¼ to ventral.

Gray brown, paler below. (Müller and Henle; Garman.)

Arabia, India, East Indies, China, Indochina, Japan, New South Wales, South Australia, Polynesia, Hawaii.

EULAMIA LAMIA (Blainville)

Squalus lamia BLAINVILLE, Faune Française, Poissons, p. 88, pl. 22, fig. C, 1820 (on Duhamel, Traité général des pêches, vol. 4 (sect. 9, chapt. 4, art. 1), p. 297, pl. 19, 1769–82, type locality: "Nos mers").

Squalus (*Carcharinus*) *lamia* GRAY, List fish British Museum, p. 44, 1851 (no locality).

Carcharinus lamia BLAINVILLE, Bull. Soc. Philoma., Paris, vol. 8, p. 121, 1816 (name only).—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 6, p. 260, fig. 3, 1924 (New Zealand).

Carcharias lamia RISSO, Hist. Nat. Europe mérid., Poissons vol. 3, p. 119, 1826 (not fig.).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 372, 1870 (Mediterranean; Atlantic); Ann. Mag. Nat. Hist., London, ser. 4, vol. 13, p. 158, 1874 (Shanghai).—PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p. 853 (Pacific Ocean).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 48, 1885 (Togian, Bay de Tomini, North Celebes).—GÜNTHER, Rep. Voy. *Challenger*, vol. 31, p. 5, 1889 (Kermadec Group).—BOULENGER, Proc. Zool. Soc. London, 1892, p. 136 (Muscat).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 481, 1910 (Muscat; Kermadec Islands).—ZUGMAYER, Abh. Bayer, Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).

Carcharias (*Prionodon*) *lamia* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 37, pl. 12, 1841 (Mediterranean; Atlantic).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 356, 1865 (Malabar, Cape of Good Hope, Bay of Sharks, West Australia).

Prionodon lamia DAY, Fishes of Malabar, p. 270, 1865 (compiled).

Squalus carcharias (part) LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 235, 1758; ed. 12, vol. 1, p. 400, 1766.—WALBAUM, Artedi Pisc., vol. 3, p. 514 (copied), 1792.—FORSTER, Fauna Indica, p. 18, 1795.—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 169, pl. 8, fig. 1, 1798 (no locality).—SCHNEIDER, Syst. Ichth. Bloch, p. 132, 1801 (copied).

Squalus commersonii BLAINVILLE, Faune Française, Poissons, p. 90, 1820 (on *Squalus carcharias* Lacépède).

Carcharhinus commersonii BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816 (name only).

Carcharinus commersonii GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 140, 1913 (Mediterranean, Atlantic, Pacific).

Eulamia commersonii FOWLER and BALL, Bishop Mus. Bull. 26, p. 4, 1925 (Kauai, Laysan, Nikoa, Gardner and Wake Islands).—FOWLER, Bishop Mus. Bull. 38, p. 3, 1927 (Jarvis Island); Mem. Bishop Mus., vol. 10, p. 20, 1928 (Honolulu, Laysan, Gardner and Wake Islands, types of *Carcharias insularum* and *Carcharias nesiotes*); Hong Kong Nat., vol. 1, p. 82, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, 1929, p. 493, 1930 (Hawaii; Atlantic); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, pt. 53, 1936 (Florida).

? *Carcharhinus lividus* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816 (name only).

? *Carcharhinus ustus* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816 (name only).

? *Carcharhinus heterodon* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816 (name only).

? *Carcharhinus verus* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816 (name only).

? *Carcharhinus broussonetti* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816 (name only).

Squalus (*Carcharias*) *maou* LESSON, Voy, *Coquille*, Zool., vol. 2, pt. 1, p. 91, pl. 1, 1830 (type locality: Society Islands).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 379, 1865 (note).

Carcharias (*Prionodon*) *maou* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 44, 1841 (Pomotus).

Squalus (Carcharinus) maou Gray, List. fish Brit. Mus., p. 46, 1851 (reference).

Carcharias maou Günther, Cat. Fish. Brit. Mus., vol. 8, p. 363, 1870 (note).

Carcharinus maou Garman, Mem. Mus. Comp. Zool., vol. 36, p. 144, 1913 (copied).

Eulamia maou Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).

Carcharias (Prionodon) amboinensis Müller and Henle, Syst. Beschr. Plagiostomen, p. 40, pl., fig. 1841 (dentition) (type locality: Amboina).—Bleeker, Nat. Tijds. Nederland. Indië, vol. 6, p. (458) 507, 1854 (Amboina).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 361, 1865 (compiled).

Carcharias (Prionace) amboinensis Bleeker, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 306, 1868 (Aru Islands).

Carcharias amboinensis Günther, Cat. Fishes British Mus., vol. 8, p. 372, 1870 (compiled).—Weber, *Siboga* Exped., Fische, vol. 57, p. 540, 1913 (Lomblen).

Squalus (Carcharias) amboinensis Gray, List fish British Museum, p. 45, 1851 (reference).

Carcharinus amboinensis Garman, Mem. Mus. Comp. Zool., vol. 36, p. 134, 1913 (Amboina).

Eulamia amboinensis Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 492, 1930 (reference).

Carcharias (Prionodon) leucas Müller and Henle, Syst. Beschr. Plagiostomen, p. 42, 1841 (type locality: Antilles).

Carcharias leucas G. Bennett, Gatherings Nat. Australasia, p. 29, 1860 (Port Jackson).—Jouan, Mém. Soc. Imp. Sci. Nat. Cherbourg, vol. 9, p. 190, 1863 (between New Caledonia and Australia); ser. 2, vol. 5, p. 106, 1870 (Seychelles).

Carcharias (Prionodon) leucos Duméril, Hist. Nat. Elasmobr., vol. 1, p. 358, 1865 (Antilles; Algeria).

Squalus (Carcharinus) milberti (not Müller and Henle) Gray, List fish British Museum, p. 45, 1851 (India).—Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 35, 1860 (Calcutta).

Carcharias (Prionodon) fasciatus Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 37, 1852 (type locality: Batavia, Java); Nat. Tijdschr. Nederland. Indië, vol. 4, p. 510, 1853 (Batavia).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 363, 1865 (compiled).

Carcharias fasciatus Günther, Cat. Fishes British Mus., vol. 8, p. 368, 1870 (compiled).

Eulamia fasciata Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).

Carcharias (Prionodon) zambezensis Peters, Monatsb. Akad. Wiss. Berlin, 1852, p. 276 (type locality: East Africa).—Martens, *in* von der Decken's Reise Ost Afrika, vol. 3, pt. 1, p. 144, 1859–69 (Zambezi at Tette and Sena).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 358, 1865 (note).—Peters, Reise Mossambique, vol. 4, p. 7, pl. 1, fig. 2, 1868 (Zambesi, 120 miles from coast).

Carcharias zambesensis Boulenger, Catalogue freshwater fishes Africa, vol. 1, p. 2, 1909 (compiled).

Carcharinus zambesensis Barnard, Ann. South Afric. Mus., vol. 21, pt. 1, p. 25, 1925 (compiled).

Squalus longimanus Poey, Mem. hist. nat. Cuba, vol. 2, p. 338, pl. 19, figs. 9–10, 1858–61 (teeth) (type locality: Cuba).

Carcharias (Prionodon) obtusirostris Moreau, Hist. Nat. Poiss. France, vol. 1, p. 332, figs. 53–54, 1880 (teeth) (type locality: Cette; Nice; Atlantic Ocean).

Carcharias lamiella Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, p. 110, 1882 (type locality: San Diego, Calif.).

Carcharias (*Prionodon*) *siamensis* Steindachner, Ann. Hofmus. Wien, vol. 11, p. 229, 1896 (type locality: Mouths of Irrawaddy, Rangoon, Burma).

Eulamia (*Platypodon*) *platyrhynchus* Gilbert, Proc. U. S. Nat. Mus., vol. 14, p. 543, 1891 (type locality: Revillagigedo Islands, Lower California).

Carcharias insularum Snyder, Bull. U. S. Fish Comm., vol. 22 (1902), p. 513, pl. 1, fig. 1, 1904 (type locality: Off Diamond Head; between Molakai and Oahu).

Carcharias nesiotes Snyder, Bull. U. S. Fish Comm., vol. 22 (1902), p. 514, pl. 1, fig. 2, 1904 (type locality: French Frigates Shoals; Laysan).

Carcharias spenceri Ogilby, Proc. Roy. Soc. Queensland, vol. 23, pt. 1, p. 3, 1911 (type locality: Brisbane River).

Carcharhinus spenceri Ogilby, Mem. Queensland Mus., vol. 5, p. 81, 1916 (Moreton Bay, Great Sandy Straits, Old Woman Island, Hervey Bay, Rocky Island Reef).—McCulloch and Ogilby, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).

Eulamia spenceri Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 492, 1930 (compiled).

Galeolamnoides spenceri Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Depth $4\frac{4}{5}$ to 5 to subcaudal origin; head $3\frac{4}{5}$ to $3\frac{7}{8}$, width $1\frac{2}{5}$ to $1\frac{1}{2}$. Snout $2\frac{7}{8}$ to 3 in head, rather wide, broad, obtusely rounded; eye 12 to $14\frac{2}{5}$, $4\frac{2}{5}$ to $4\frac{1}{2}$ in snout, $9\frac{1}{2}$ to 10 in interorbital; mouth width $1\frac{3}{4}$ to $2\frac{1}{2}$ in head, short labial fold at each angle; preoral length $2\frac{3}{4}$ to $3\frac{1}{5}$ in head; teeth in 28 to 30 rows in jaws, subtriangular, lower erect and narrower, all serrated; nostrils from first $\frac{2}{5}$ to last $\frac{2}{5}$ in preoral length, each more or less subequal with orbit, internarial $\frac{2}{3}$ to $\frac{4}{5}$ of preoral length; interorbital $1\frac{3}{4}$ to 2 in head, moderately high and convex. Gill openings equidistant, third and fourth longest, last 2 over pectoral base.

Scales quindentate, with as many small keels.

First dorsal origin opposite inner pectoral angle, well behind pectoral base, front edge $1\frac{1}{4}$ to $1\frac{1}{3}$ in head; front edge of second dorsal 3 to $3\frac{1}{2}$, fin length $2\frac{2}{5}$ to $2\frac{1}{2}$, inserted trifle before anal origin; front anal edge $2\frac{1}{2}$ to $2\frac{3}{5}$, fin length $2\frac{1}{5}$ to $2\frac{1}{2}$; least depth of caudal peduncle $4\frac{3}{4}$ to 5; ventral length $2\frac{1}{10}$ to $2\frac{1}{3}$; caudal $2\frac{1}{2}$ to 3 in rest of body, subcaudal $1\frac{1}{3}$ to $1\frac{1}{2}$ in head; pectoral $3\frac{1}{4}$ to $3\frac{1}{2}$ in total length to subcaudal origin, width $1\frac{4}{5}$ to $2\frac{1}{3}$.

Gray to neutral gray above, sometimes irregularly variegated or mottled darker in preserved examples. Under surfaces paler to whitish. Fins often dusky towards tips, sometimes broadly pale on smaller ones. Young bluish, with fins variously dusky terminally, sometimes first dorsal pale apically.

Arabia, East Africa, Cape Colony, Seychelles, India, East Indies, China, Western Australia, Queensland, New South Wales, Kermadec Islands, Melanesia, Polynesia, Hawaii. Also in the Eastern Pacific in California, Lower California, Revillagegedos and Galapagos, besides the warmer Atlantic. It includes an extensive synonymy with *Squalus lamia* as apparently the earliest available name. Though Garman accepted *Squalus* (*Carcharias*) *maou* Lesson, its imperfect description and crude figure, likely in part at least inaccurate, suggest to me it may more probably have been intended for the present species.

Carcharias (*Prionodon*) *amboinensis*, described with second dorsal opposite anal, smaller; caudal slender, acute; pectoral acute; ventral partly quadrate, little emarginate.

Above gray-blue, with numerous transverse diffuse deep bands, below whitish. Fins gray-blue or clouded bluish. Length, 2,860 mm. (Bleeker.)

Carcharias (*Prionodon*) *zambezensis* Peters seems close to, if not the same as the present species. It is figured with the first dorsal origin clearly behind the pectoral base.

The imperfectly noticed nominal *Carcharias* (*Prionodon*) *fasciatus* Bleeker is likely an adult variant of the present species, with which Bleeker compares it.

Depth 8½ in total length, body elongate, compressed; head 6, obtuse, broader than high. Snout obtuse, short; short preoral; mouth width twice preoral, broader than long, semilunar; teeth in jaws triangular, oblique, broad, all serrated, outer basal edge serrated.

First dorsal nearer pectoral than Müller and Henle is incompletely, if not unsatisfactorily noticed by these authors. Though Garman placed it near *Eulamia plumbea* (Nardo), from which he thinks it differs in longer pectorals, with sharp outer and rounded hinder angles and with their hind margins deeply indented, besides its broad, triangular subequal teeth. Even Müller and Henle's figures of the dentition do not leave it clear to me that such may not be individual variation. I suspect *Carcharias* (*Prionodon*) *siamensis* Steindachner to be the present species. The following is condensed from the original account:

Snout broad, obtusely rounded. Eye very small. Preoral length more than 1⅓ times mouth width. Deep crescentic groove near mouth angle; lip without fold. Jaw teeth as in *Carcharias pleurotaenia* Bleeker; upper regular, triangular, even isosceles, edges clearly serrate, in 29 rows; lower very slender, pointed, edges very obscurely serrated, on wide entire base, rows 29. Inner nasal angle more than twice nearer snout end than front mouth edge. Depth of first gill opening equals half of last, which ⅓ snout length.

Scales small, with 3 keels, each keel ending in point behind.

First dorsal nearer pectoral than ventral base, base length 1¾ in head measured to last gill opening, upper fin angle blunt with rounded tip, hind upper fin edge very weakly concave, fin ends in point behind. Second dorsal not clearly better developed than anal of which it begins little in advance, hind edge less weakly concave than anal, origin from first dorsal fin 3¼ times greater than base length of second dorsal. Caudal length more than 3⅗ in total length, terminally truncate below; front edge of falcate subcaudal 2½ in fin. Pectoral moderate, triangular, upper edge weakly convex, lower edge strongly concave; inner hind edge forms right angle, form of fin rounded falcate, upper edge 3 times longer than lower.

Above and on sides lead color, below yellowish white. Caudal somewhat darker at angular tip or gray black, though without dark blotch. Paired fins dirty yellowish white. Length, 630 mm.

It seems to me that *Carcharias spenceri* Ogilby is a synonym of the present species. It is described with a short blunt snout, and though the first dorsal is said to be inserted a little nearer to the pectoral than to the ventral, it is not however described as over the pectoral base. Moreover, the pectoral is said to extend below or beyond the end of the first dorsal. Ogilby's type was 1,220 mm. long and is No. 290 in the Queensland Museum. Also an example from Brisbane, 315 mm.

U.S.N.M. No. 51213. Hawaii. U. S. Fish Commission. Length, 850 mm.

U.S.N.M. No. 62457. Between Molokai and Oahu. Bureau of Fisheries. Length, 580 mm.

U.S.N.M. No. 62465. Between Molokai and Oahu. Bureau of Fisheries. Length, 585 mm.

U.S.N.M. No. 62470. Between Molokai and Oahu. Bureau of Fisheries. Length, 560 mm.

U.S.N.M. No. 50859. Off Diamond Head, Oahu. *Albatross* collection. Length, 2,130 mm. Type of *Carcharias insularum.*

U.S.N.M. No. 50860. French Frigates Shoals. Bureau of Fisheries. Length, 1,488 mm. Type of *Carcharias nesiotes.*

EULAMIA ALBIMARGINATA (Rüppell)

Carcharias albimarginatus Rüppell, Neue Wirbelth., Fische, p. 64, pl. 18, fig. 1, 1835 (type locality: Ras Mehamet, Red Sea).

Carcharias albomarginatus Günther, Cat. fishes British Mus., vol. 8, p. 370, 1870 (compiled).

Carcharias (*Prionodon*) *albimarginatus* Müller and Henle, Syst. Beschr. Plagiostomen, p. 44, 1841 (Ras Mehamet).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 366, 1865 (Red Sea).

Carcharias (*Prionodon*) *albomarginatus* Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 660, 1871 (Red Sea).—Martens, Preuss. Exped. Ost.-Asien, vol. 1, p. 409, 1876 (Makassar Straits).—Brusina, Glasnik Naravosl. Družtva, vol. 3, p. 223, 1888 (Red Sea).

Squalus (*Carcharinus*) *albimarginatus* Gray, List fish British Museum, p. 46, 1851 (reference).

Carcharinus albimarginatus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 141, 1913 (Red Sea).

Eulamia albomarginata Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).

Carcharias pharaonis (Ehrenberg) Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 660, 1871 (name in synonymy).

Depth 6¾ to subcaudal origin; head 4¼, width 1⅖. Snout 2¼ in head, obtusely rounded, blunt; eye 7½, 3¼ in snout, about 4¾ in interorbital; mouth width 1⅞ in head, gape length half its width or 1¼ in preoral length; teeth in 25 to 27 rows in jaws, serrated, triangular, upper slightly inclined and notched on outer edge, narrower lower erect, indented on outer edge and median teeth in both jaws small and with entire edges: nostrils nearer mouth than snout end, internarial little greater than preoral or 1⅛ in snout; interorbital rather low. Gill openings equidistant. gradually smaller to last, of which 2 above pectoral.

First dorsal origin close behind inner pectoral angle, front fin edge 1½ in head; second dorsal length 2⅓, origin little forward of anal origin; anal length 2⅔; pectoral 1⅛, width 2½ its length which 1¾ to ventral; ventral length 2⅗ in head; caudal 2⅔ in rest of body, subcaudal 2¼ in caudal.

Grayish yellow, lighter below, tips and hind fin edges pure white. (Rüppell; Garman.)

Red Sea, East Indies. Rüppell says the body dimensions are like those of *Carcharias melanopterus*. Duméril gives 940 mm. as the length of a specimen in the Paris Museum. The species seems to be distinctive in the pure-white borders to its fins.

EULAMIA ELLIOTI (Day)

Carcharias ellioti DAY, Fishes of India, pt. 4, p. 716. pl. 189, fig. 2, 1878 (type locality: Kurrachee); Fauna British India, Fishes, vol. 1, p. 15, 1888 (copied).—BOULENGER, Proc. Zool. Soc. London, 1889, p. 135 (Muscat).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran and Oman).

Carcharinus ellioti GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 142, 1913 (India).

Carcharias murrayi GÜNTHER. Ann. Mag. Nat. Hist., ser. 5, vol. 11, p. 137, fig. 1883 (teeth) (type locality: Kurrachee.)—MURRAY. Ann. Mag. Nat. Hist., ser. 5, vol. 13, p. 389, 1884 (jaws from Kutch).—DAY, Fishes of India. Suppl. p. 809, 1889 (Kurrachee); Fauna Brit. India, Fishes, vol. 1, p. 16, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—ZUGMAYER. Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran and Oman).

Depth 5¼ to subcaudal origin; head 5¼, width 1⅙. Snout 3 in head, obtusely rounded; eye 9, 3 in snout, 6¼ in interorbital; mouth width 2 in head, length of gape 1⅘ its width, well developed upper labial groove, slight lower one: teeth 24 to 26 rows above, 30 to 34 below, upper nearly triangular without notch or basal enlargement though coarsely serrated, lower obliquely erect, awllike, smaller and more triangular at mouth angle; awl-shaped teeth with cusp either side of base, below which outer edge with few serrations; nostrils nearer mouth than snout end. internarial about 1⅛ in preoral length which 2⅔ in head; interorbital 1⅓, convexly elevated. First gill opening largest, others equidistant, last 2 smallest and over pectoral.

First dorsal inserted little behind inner pectoral angles, front edge equals head; second dorsal origin opposite anal origin, front fin edge 1⅕; front anal edge 1¼; ventral length 1⅓; caudal 4⅗ in rest of body, subcaudal 2⅖ its length; pectoral 4½ in body to subcaudal origin, width half its length which reaches 1⅔ to ventral origin.

Gray superiorly, becoming nearly white beneath. Length, 1,830 mm. (Day.)

Arabia, India. Though Day gives caudal 3¾ in the total length his figure shows 5⅗.

EULAMIA TEMMINCKII (Müller and Henle)

Carcharias (*Prionodon*) *temminckii* Müller and Henle, Syst. Beschr. Plagiostomen, p. 48, pl. 18, 1841 (type locality: Pondicherry).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 378, 1865 (compiled).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Makassar Straits).

Carcharias temminckii Günther, Cat. Fishes British Mus., vol. 8, p. 374, 1870 (Calcutta).—Day, Fishes of India, pt. 4, p. 717, 1878 (India); Fauna British India, vol. 1, p. 17, 1889.—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, vol. 29, p. 160, 1889–90 (Rangoon).

Squalus (*Carcharinus*) *temminckii* Gray, List fish British Museum, p. 48, 1851 (Calcutta).—Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 36, 1860 (Calcutta).

Carcharinus temminckii Garman, Mem. Mus. Comp. Zool., vol. 36, p. 142, 1913 (Indian Seas).

Eulamia temminckii Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (reference).

Depth 4⅞ to subcaudal origin; head 3½, width 1¾. Snout 2⅓ in head; eye 15, 6⅖ in snout, 8 in interorbital, orbicular; dentary width 2⅖ in head, length 1⅗ its width with very short transverse groove around angle and upper jaw; teeth in 36 rows above, 30 below, upper serrated and rather broadly triangular, lower narrowly lanceolate, erect and entire, all with broad bases; nostrils about last ⅖ in preoral length, aperture width 2½ in internarial, front valve small triangular flap; interorbital 2, broad, slightly convex. Gill openings about equidistant, last shortest and fourth and fifth above pectoral origin.

Scales very small, tricuspid, with 3 keels, finely velvety to touch.

First dorsal origin opposite hind inner angle of depressed pectoral, front edge 2⅙ in head; second dorsal origin slightly behind anal origin, front edge 2⅗ in head; anal origin slightly nearer ventral origin than subcaudal origin, front edge 2⅘ in head, fin smaller than second dorsal; subcaudal front edge 2¼ in head, 2 in its own length; least depth of caudal peduncle 5½ in head; pectoral 1⅖, width 1⅖ its length; ventral length 2⅕ in head.

Fawn color above, below whitish. On head whitish of lower surfaces extends up to include side of snout and head until at least level with upper part of eye. Iris gray. Fins largely gray terminally.

India, Burma, East Indies. Apparently rare in collections. Known chiefly by its second dorsal distinctly larger than the anal, wide pectoral, small eye and teeth.

U.S.N.M. No. 8090. No locality. National Institute. Length, 403 mm.

EULAMIA MUNSING (Bleeker)

Carcharias (*Prionodon*) *munsing* BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 16, 1849 (type locality: Madura Straits near Kammal and Surabaya); (Plagiost.), vol. 24, pp. 27, 32, pl. 1, fig. 2, 1852 (head) (Kammal and Surabaya).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 354, 1865 (compiled).

Carcharias munsing GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 365, 1870 (compiled).

Carcharinus munsing GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 144, 1913 (Java).

Eulamia munsing FOWLER, Occas. Pap. Bishop Mus., vol. 8, no. 7, p. 3, 1923 (Honolulu); Mem. Bishop Mus., vol. 10, p. 21, fig. 6, 1928 (Honolulu specimen); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 493, 1930 (Hawaii).

Head 5½ to subcaudal origin, greatly wider than deep. Snout in profile about 3⅔ in head, depressed, widely convex or blunt as seen from above; eye small, lateral, about first third in head, diameter about ⅓ in snout length as seen in profile; mouth width 1⅕ in head, well arched, length 1⅘ its width, which much greater than preoral, with slight groove above angle; teeth in about 24 rows in jaws; upper teeth well serrated, broadly triangular, lower entire and with slender cusps; nostrils midway in preoral length, each subequal with eye, internarial equals preoral length; interorbital about 1⅕. No spiracle.

Scales rather diamond-shaped, with 5 strong parallel ridges formed to slightly serrated edges.

First dorsal origin nearer ventrals than pectorals or origin at last ⅖ in space between pectoral and ventral origins, front fin edge about 1⅓ in head; second dorsal little smaller than first, slightly larger than anal; second dorsal and anal origins apparently opposite; caudal 3 in rest of body; subcaudal about 1¼ in head; pectoral 5⅕ in body to upper caudal origin, width 1½ its length which half way to ventral; ventral length 1¼ in head.

Uniform gray-brown above, under surface paler. Iris slaty.

Originally known only from Java, from 2 specimens, a male and female 390 to 401 mm. The above description from a cast and head of an example 1,500 mm. taken in the Honolulu market about 1904 and now in the Bishop Museum.

Genus GLYPHIS Agassiz

Glyphis AGASSIZ, Poissons Fossiles, vol. 3, p. 243, 1843. (Type, *Glyphis hastalis* Agassiz, monotypic. *Glyphis* Carpenter, 1857, in mollusks precluded.)

Galeus VAIMONT, Dict. Hist. Nat. Poiss., vol. 1, p. 464, 1768. (Species nonbinomial. Type, *Squalus glaucus* Linnaeus, designated by Garman, Mem. Mus. Comp. Zool., vol. 36, p. 4, 1913.) (Inadmissible.)

Prionodon (not Horsfield, 1823, in mammals) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 35, 1841. (Type, *Squalus glaucus* Linnaeus, designated by Fowler, Geol. Surv. New Jersey Bull. 4, p. 74, 1911.)

Prionace CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1399, 1849. (Type, *Squalus glaucus* Linnaeus, virtually, as *Prionace* Cantor proposed to replace *Prionodon* Müller and Henle.)

Body elongate, partly fusiform, tapering to head and tail. Head depressed. Snout pointed, elongate. Eyes lateral, nictitating membranes well developed. Mouth inferior, greatly arched, with rudimentary labial folds, short and hidden at mouth angles. Teeth curvilinear triangles, with serrated edges and broad bases. Nostrils oblique, nearer mouth than snout end. Last 2 gills above pectoral base. No spiracles. Scales minute, with wide, tricarinate crowns. Dorsals, anal, and ventrals small. First dorsal nearer ventrals than pectorals. Second dorsal opposite anal. Caudals narrow, pointed. Pit before caudal above and below.

Temperate and tropical seas.

ANALYSIS OF SPECIES

a^1. Head $4\frac{1}{8}$ to $4\frac{1}{2}$; ventral not larger than anal; pectoral with innermost margin concave.. glaucus

a^2. Head 4; ventral larger than anal; pectoral with innermost margin rounded. mackiei

GLYPHIS GLAUCUS (Linnaeus)

Squalus glaucus LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 235, 1758 (type locality: Ocean Europaeo); ed. 12, vol. 1, p. 401, 1766.—GMELIN, Syst. Nat. Linn., vol. 1, p. 1496, 1789 (in omni mari).—WALBAUM, Artedi Pisc. vol. 3, p. 513, 1792 (copied).—FORSTER, Fauna Indica, p. 13, 1795.—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 213, pl. 9. fig. 1, 1798.—SCHNEIDER, Syst. Ichth. Bloch, p. 131, 1801 (omni mari).—CUVIER, Règne Animal, vol. 2, p. 126, 1817 (reference).—G. BENNETT, Gatherings Nat. Australasia, p. 33, 1860 (Australia).

Squalus (*Carcharinus*) *glaucus* GRAY, List fish British Museum, p. 44, 1851 (English coast; no locality).

Carcharhinus glaucus BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1916 (name only).

Carcharinus glaucus BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 26, 1925 (Agulhas Bank).

Carcharias (Prionodon) glaucus MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 36, pl. 11, 1841 (Mediterranean; Atlantic Ocean).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 353, 1865 (no locality; New Zealand).

Carcharias glaucus GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 364, 1870 (Pondicherry, English coast, Mediterranean, St. Helena, Port Arthur, Australia).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 351, 1881 (Port Arthur, Tasmania).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 1, 1888 (Australia); Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1768, 1888 (compiled).—GÜNTHER, Rep. Voy. *Challenger*, vol. 31, p. 5, 1889 (South Atlantic and Japan).—KENT, Naturalist in Australia, p. 193, 1897.—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 62, 1897.—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 479, 1910 ("Polynesia").

Prionodon glaucus SCHMELTZ, Cat. Mus. Godeffroy, No. 4, p. 28, 1869 (Pacific).

Prionace glauca RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 56 (Swatow).—OGILBY, Proc. Linn. Soc. New South Wales, vol. 23, p. 732, 1898 (Lord Howe Island).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 127, 1901 (reference).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 613, 1903 (Misaki).—SNYDER, Bull. U. S. Fish. Comm., vol. 22 (1902), p. 515, 1904 (lat. 28°31′ N., long. 141°47′ W.).—STEAD, Fishes of Australia, p. 232, 1908.—McCULLOCH, Zool. Res. *Endeavour*, vol. 1, p. 9, 1911 (South Australia).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus., Vertebrata, p. 190, 1920 (Boshiu).—JORDAN and JORDAN, Mem. Carnegie Mus., vol. 10, p. 4, 1922 (Hawaii).—PHILLIPPS, New Zeal. Journ. Sci. Techn., vol. 6, p. 2261, fig. 5, 1924 (Lyall Bay).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 101, 1925 (Misaki, Tokyo and Osaka markets).—McCULLOCH, Fishes New South Wales, ed. 2, p. 6, pl. 1, fig. 10a, 1927.—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 231, fig. 7, 1932 (Chefoo).—WANG, op. cit., vol. 9, p. 91, 1933 (Chusan; Wenchow).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 198, 1934 (reference).

Prionace glaucum WAITE, Rec. South Australian Mus., vol. 2, p. 12, fig. 10, 1921.

Galeus glaucus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 145, pl. 3, fig. 13, 1913 (Japan, Massachusetts Bay).—TANAKA, Jap. Fish. Life Colours, no. 17, 1933.

Glyphis glaucus FOWLER, Mem. Bishop Mus., vol. 10, p. 19, 1928 (Hawaiian Islands); Hong Kong Nat., vol. 1, p. 81, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 491, 1930 (Hawaii, California, Chile, Atlantic); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 54, fig. 13, 1936 (Italy).

Squalus caeruleus BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816 (name only); Faune Française, vol. 1, p. 90, 1828 (type locality: Mediterranean).

Carcharias hirundinaceus (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 37, 1841 (type locality: Brazil).

Carcharias pugae PEREZ, Estudios sobre algunos escualos de la costa de Chile, p. 2, 1886 (type locality: Chile).—PHILIPPI, Anal. Univ. Chile, vol. 71, p. 538, pl. 1, fig. 2, 1887 (Valparaiso).

Carcharias gracilis PHILIPPI, Anal. Univ. Chile, vol. 71, p. 539, pl. 2, fig. 1, 1887 (type locality: Chile).

Carcharias aethiops PHILIPPI, Anal. Univ. Chile, vol. 109, p. 311, 1901 (type locality: Chile).

Depth 5½ to 7¼ to subcaudal origin; head 4⅛ to 4½, width 2. Snout 2⅓ to 2¾ in head, conic, depressed; eye 5½ to 8½, 2½ to 3 in snout, 2⅘ to 3 in interorbital; mouth gape ⅗ its width to ⅞ latter, 3½ to 3⅗ in head; preoral length 2 to 2⅓ in head; teeth large, serrate, upper broadly triangular with slightly curved ends and lower narrower teeth more erect; nostril moderate, with very obtuse flap, little nearer mouth than snout tip or midway; internasal ⅗ to ⅔ of mandible width; interorbital 2 to 2⅕ in head, broad, depressed, very slightly convex. Gill openings about long as eye, last 2 above pectoral base.

Scales minute, each with 3 keels.

First dorsal about midway between snout tip and subcaudal origin or midway between paired fins, front edge 1¾ to 2⅛ in head; second dorsal length 2⅘ to 3; anal similar, little smaller and opposite second dorsal, length 3 to 3⅕; caudal 2⅗ to 2⅔ in rest of body, subcaudal 2⅘ to 3 in caudal length; pectoral 3 to 4⅗ in combined head and body to subcaudal origin, width 2⅖ its length; ventral inserted nearly midway between origins of dorsals, length 2⅔ to 3 in head.

Gray to light blue, sometimes with violaceous tint in young, on upper surfaces. Sometimes adults neutral slaty or gray black. Lower surfaces of body white, often soiled.

South Africa, China, Japan, Lord Howe Island, Queensland, New South Wales, Tasmania, New Zealand. Also in the Eastern Pacific and throughout the Atlantic.

The blue shark is so called from its color, which is always a deep blue on the upper half of the body, the under surface white. In the young the blue color is often very brilliant and with violet or purple tints. Its food is chiefly fish.

"When in pursuit of prey or excited, they continually cover and uncover their eyes with their nictitating membrane. The time of their greatest activity is at night, when they may be seen stealing through our summer seas like beasts of prey: their bodies not even disturbing the phosphorescence which at that time of the year so fills the ocean. A most puzzling circumstance; and but for the flexible part of the dorsal fin and tip of the tail, it would be impossible to detect their presence in the darkest night." (Dunn.)

U.S.N.M. Nos. 52637–52640. Lat. 28°31′00″ N., long. 141°47′00″ W. (Hawaii). Bureau of Fisheries, 1901–1902.

U.S.N.M. Nos. 52645–52650. Lat. 28°31′00″ N., long. 141°47′00″ W. Bureau of Fisheries, 1901–1902.

U.S.N.M. No. 52676. Hawaii. Bureau of Fisheries, 1901–1902.

U.S.N.M. Nos. 52765, 52766. Honolulu. Bureau of Fisheries, 1901–1902.

U.S.N.M. No. 54605. Lat. 28°31′00″ N., long. 141°47′00″ W. Bureau of Fisheries, 1902.

U.S.N.M. No. 55001. Lat. 28°31′00″ N., long. 141°47′00″ W. Bureau of Fisheries, 1901–1902.

U.S.N.M. No. 58538. Lat 28°31′00″ N., long. 141°47′00″ W. Bureau of Fisheries, 1901–1902.

GLYPHIS MACKIEI (Phillipps)

Prionace mackiei PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 16, p. 238, fig. 2, 1935 (type locality: Lyall Bay, Wellington).

Depth 8 to origin of subcaudal; head to first gill opening 5½. Snout 2⅗ in head to first gill opening; eye 2¾ in snout. Gill openings 5, subequal, posterior totally behind pectoral origin.

First dorsal origin nearer ventral origin than pectoral origin, front edge of fin 1¾ in head; length of second dorsal 1¾ in head; length of second dorsal 1¾ in front edge of first dorsal, slightly smaller than anal which opposite; anal origin little in advance of second dorsal origin; tail slender, upper caudal lobe acuminate to end, length 3¼ in rest of fish; subcaudal length ½ of caudal length; pectoral 1⅖ in head; ventral origin behind end of depressed first dorsal and over half large as same fin.

Length, 6 feet 3 inches. (Phillipps.)

Genus LOXODON Müller and Henle

Loxodon MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 61, 1841. (Type, *Loxodon macrorhinus* Müller and Henle, monotypic.)

Body elongate, slender, cavity less than half total length. Head depressed, moderately wide. Snout long. Eye moderate, pupil rounded, orbit elongate, nicitating membrane well developed and below eye. Mouth greatly arched, with short labial fold. Teeth oblique, subequal, with smooth edges, outer of which deeply notched near base. Nostrils midway from snout end to mouth, nasal valve with sharp lobe. Spiracle porelike, behind orbit. Dorsals above space between pectorals and ventrals, second dorsal small and near caudal. Caudal long, pointed, pit in front above and another below. Subcaudal lobe large, notch behind. Pectorals moderate. Ventrals small.

LOXODON MACRORHINUS Müller and Henle

Loxodon macrorhinus MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 61, pl. 25, 1841 (locality unknown).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 395, 1865 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 21, p. 662, 1871 (Red Sea).—BRUSINA, Glasnik Naravosl. Družtva, vol. 3, p. 224, 1888 (Red Sea).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 107, 1913 (Mauritius; Indian Ocean).

Depth 11 to subcaudal origin; head 4½, width 2¼. Snout 2⅓ in head; eye 5⅔, 2½ in snout, 2⅗ in interorbital; mouth width 3⅔ in head, length 1½ its width, short labial fold around each angle; teeth in 25 rows above, 26 below, oblique cusp directed outward over deep notch on outer edge, edges of all entire; nostrils small, midway in preoral, nasal valve with short pointed lobe, internarial 2 in preoral length; interorbital about 2⅔ in head, nearly level. Gill openings small, equidistant, last above pectoral.

Scales small, tridentate, median point longest.

First dorsal origin midway between pectoral and ventral origins, front fin edge 1⅗ in head; second dorsal begins behind anal base, length 2⅗ in head; anal length 2⅓; least depth of caudal peduncle 4⅔; pectoral 1⅗, not quite reaching opposite first dorsal origin, width 2 in its length; ventral length 3 in head; caudal 2⅕ in rest of body, subcaudal 3 in caudal or 1½ in head.

Gray-brown, edges of fins paler. Length, 305 mm. (Müller and Henle.)

Red Sea, Mauritius. Garman's specimen was 433 mm.

Genus HEMIGALEUS Bleeker

Hemigaleus BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 45, 1852. (Type, *Hemigaleus microstoma* Bleeker, designated by Jordan, Genera of Fishes, pt. 2, p. 250, 1919.)

Chaenogaleus GILL, Ann. Lyceum Nat. Hist. New York, vol. 7, p 411, 1862. (Type, *Hemigaleus macrostoma* Bleeker.)

Negogaleus WHITLEY, Australian Zoologist, vol. 6, p. 334, 1931. (Type, *Hemigaleus microstoma* Bleeker.)

Body slender, elongated. Head depressed, flattened below. Snout rounded or tapering. Eye with nictitating membrane. Mouth with distinct labial folds. Teeth unlike in two jaws; upper inclined, with denticles on basal part of outer edge; lower more erect, with narrow cusp on wide base, without denticles. Spiracles small. First dorsal opposite space between pectorals and ventrals. Tail with prominent subcaudal lobe, notch behind subcaudal; caudal pits present.

Small sharks, mostly from the Western Pacific and tropical Indian Ocean. Known by their distinct though small spiracles, labial folds, dentition and distinct caudal pits, also the intestine with few transverse turns to spiral valve.

ANALYSIS OF SPECIES

a^1. CHAENOGALEUS. Snout tapering, rather pointed; mouth cleft nearly as long as preoral.
  b^1. Caudal less than interdorsal space ---------- machlani
  b^2. Caudal equals interdorsal space ---------- macrostoma
  b^3. Caudal 1⅕ in interdorsal space ---------- balfouri
a^2. HEMIGALEUS. Snout broadly rounded; mouth cleft 2¾ in preoral; caudal equals interdorsal space ---------- microstoma

Subgenus CHAENOGALEUS Gill

HEMIGALEUS MACHLANI Herre

Hemigaleus machlani HERRE, Philippine Journ. Sci., vol. 40, p. 231, 1929 (type locality: Jolo, Sulu Province, Philippines).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 14, 1937 (reference).

Head trifle less than 4 in length, depressed anteriorly, much wider than high. Snout more than 1⅘ times width of arched mouth; eye equals width of gill openings; mouth length 1⅘ times it own width, labial folds on both jaws at mouth angle, upper about half length of mouth and lower fold trifle more than half length of upper; teeth in 21 rows above, larger, oblique, bases broad, with long sharp point and 5 or 6 denticulations on concave cutting edge, 3 median rows small, erect and simple; lower teeth 40, small, acute, slender, smooth, nearly erect, last 7 rows on each side very much reduced; nostrils nearer snout end than mouth angles, with triangular lobe over inner one. Spiracle hardly half an eye diameter behind eye, much larger than pores.

Anal origin behind second dorsal origin, which larger than anal and ⅔ large as first dorsal; caudal less than interdorsal space, nearly 3⅗ in length; subcaudal pointed; pectoral falciform, pointed, little more than twice long as broad, extends below middle of dorsal.

Uniform gray, becoming yellowish white underneath. Fins with reddish or violaceous tinge, more or less pale edged, tips of both dorsals whitish. Length, 773 mm. (Herre.)

Philippines.

HEMIGALEUS MACROSTOMA Bleeker

Hemigaleus macrostoma Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 46, pl. 2, fig. 10, 1852 (type locality: Batavia and Samarang); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 392, 1865 (Batavia, Java).—Kner, Reise *Novara*, Fische, p. 415, 1865 (Java).—Günther, Cat. Fish. Brit. Mus., vol. 8, p. 376, 1870 (type).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 151, 1913 (Java).—Weber, *Siboga* Exped., Fische, vol. 57, p. 591, 1913 (Makassar).—Tirant, Service Océanogr. Pêches Indo Chine, 6^e note, p. 62, 1929 (Phuroc Hai).—Chevey Inst. Océanogr. Indochine, 19^e note, p. 6, 1932 (Indochina).—Fowler, List Fish. Malaya, p. 10, 1938 (reference).

Hemigaleus marcrostoma Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 490, 1930 (reference). (Error.)

? *Hypoprion notatus* Bleeker, Verh. Batav. Genootsch. (Mid. Oost Java), vol. 23, pp. 1–23, 1850 (type locality: Java).

Depth 9 in total length, body elongate, compressed; head 6½, acute, broader than deep. Eye 2½ in snout, pupil triangular; mouth width very slightly greater than preoral length, mouth length 1¼ in mouth width; labial fold around each mouth angle, upper ⅓ upper jaw length, lower less than ¼ to symphysis; teeth in about 34 rows, bases wide, upper inclined with concave edges and 2 or 3 denticles on outer basal edge, small median teeth erect, lower triangular teeth acute, slender, smooth and erect; nostrils about first ⅖ in space between snout tip and mouth angle, though little nearer mouth than snout tip, internarial 1⅔ in preoral; nasal valves each with triangular lobe. Gill openings large, last above pectoral. Spiracle small, less than eye diameter behind eye.

Scales small, tricarinate or quadricarinate. Lateral line inconspicuous.

First dorsal nearer pectoral than ventral, high as long, emarginate, apex rounded acutely, posteriorly very acute; second dorsal before anal, similar though shorter than first dorsal; anal shorter and lower than second dorsal, 2 in space to subcaudal; caudal 4⅓ in total length, acute, emarginate; pectoral shorter than head, width less twice its length, emarginate, acute; ventral twice shorter than pectoral, claspers conic, longer than ventrals, with 3 or 4 valves.

Gray above, below whitish. Fins gray or bluish gray, partly with white edges. Length, 690 mm. (Bleeker.)

Singapore, East Indies, Indochina.

HEMIGALEUS BALFOURI Day

Hemigaleus balfouri Day, Fishes of India, pt. 4, p. 717, pl. 135, fig. 4, 1878 (type locality: Waltair, Coromandel coast); Fauna British India, Fishes, vol. 1, p. 18, fig. 2, 1889.—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 152, 1913 (Coromandel coast).

Depth 7⅓ to subcaudal origin; head 5⅖, width about 1⅗. Snout 2⅓ in head; eye 7, 3 in snout, about 4 in interorbital; mouth long as wide, 3 in head, labial folds at each mouth angle, not over one-third to symphysis, subequal; teeth in 24 rows in jaws, upper notched or with about 3 denticles along outer side of base, slightly smaller lower erect and smooth; nostrils little nearer mouth than snout end, internarial 2½ in preoral, which 2⅗ in head. Gill openings at least twice width of orbit, gradually closer to last, last 2 above pectoral base.

Front edge of first dorsal 1⅖ in head; second dorsal length 1⅔; anal length 2, origin opposite second dorsal origin; pectoral 1¼ in head, width 1⅞ its length, which half way to ventral; ventral length 1⅞, clasper slender; caudal 4 in rest of body, subcaudal 2⅕ in caudal.

Dark brown, fins gray, second dorsal with dark summit. Length, 826 mm. (Day.)

India.

Subgenus HEMIGALEUS Bleeker

HEMIGALEUS MICROSTOMA Bleeker

Hemigaleus microstoma Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 46, pl. 2, fig., 1852 (head) (type locality: Batavia); Act. Soc. Sci. Ind.-Néerl., No. 7, vol. 2, p. 9, 1857 (Amboina); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 392, 1865 (Batavia).—Günther, Cat. Fish. Brit. Mus., vol. 8, p. 375, 1870 (type).—Bartlett, Sarawak Gazette, vol. 26, no. 366, p. 133, 1896 (Moratabas).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 151, 1913 (Java).—Weber, *Siboga* Exped., Fische, vol. 57, p. 591, 1913 (Sapeh Straits).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 490, 1930 (reference); List Fish. Malaya, p. 10, 1938 (reference).

Hemigaleus pingi Evermann and Shaw, Proc. California Acad. Sci., ser. 4, vol. 16, p. 98, 1927 (type locality: Wenchow, China).

Depth 9 in total length, body elongate, compressed; head 7 to 7¼, broader than deep. Snout rather broadly rounded; eye 2⅓ to 2½ in snout, pupil triangular; mouth width nearly equals preoral length, length of gape 2½ its width; labial fold around each mouth angle, upper nearly half jaw length, lower ⅓ to symphysis; upper teeth in about 32 rows, obliquely triangular with outer edges serrated and inner edge smoothly convex, smaller lower teeth with broad bases and entire, slender, narrow cusps; nostrils at first 3/7 in space between snout tip and rictus, slightly nearer snout tip than mouth and nasal valve with triangular lobe. Last gill opening above pectoral. Spiracle small pore, close behind eye.

Scales each with 3 or 4 keels. Lateral line inconspicuous.

First dorsal midway between pectorals and ventrals, high as long, emarginate, angle acute; second dorsal before anal, shorter and lower than first dorsal; anal little lower than long, angles acute, strongly emarginate, twice in space to subcaudal; caudal 2 in total length, strongly emarginate; pectoral twice long as wide, emarginate, strongly acute; ventral subquadrate, little longer than broad, emarginate, angles acute.

Above reddish gray, below yellowish. Fins gray, second dorsal dusky, apex whitish. Length, 701 mm. (Bleeker.)

Singapore, East Indies, China.

The imperfectly described *Hemigaleus pingi* is probably synonymous, having been based on a young specimen:

Body elongate, slender; head depressed, flattened below. Nictitating membrane present; preoral equals mouth width; mouth inferior, crescentic, with distinct labial folds, groove at angle extending some distance on each jaw; 3 rows of teeth on upper and lower jaws, each tooth with basal lobe; nostrils nearer mouth than to snout, space between their outer points slightly greater than mouth width; space between eye and spiracle about 3 in eye diameter. Spiracle small. First dorsal opposite space between pectorals and ventrals; second dorsal little in advance of anal; pit below and one above caudal; "pectoral near gill opening." Dark brown, lighter below. A few black spots on each side of body. Length, 266 mm. (Evermann and Shaw.)

Genus GALEOCERDO Müller and Henle

Galeocerdo Müller and Henle, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 115. (Type, *Squalus arcticus* Faber, *in* Müller and Henle, Arch. Naturg., 1837, p. 397, monotypic.)

Galeodes (not Olivier, 1791, in Arachnida, or Bolten, 1798, in Mollusca) Heckel, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 11, p. 324, 1854. (Type, *Galeodes priscus* Heckel, monotypic.) (Fossil.)

Boreogaleus Gill, Ann. Lyceum Nat. Hist. New York, vol. 7, pp. 402, 411, 1862. (Type, *Squalus arcticus* Faber, orthotypic.)

Body robust, elongated. Head depressed. Snout wide, short. Eye moderate, with nictitating fold. Mouth crescentic, large, labial folds on both jaws. Teeth alike in two jaws, oblique, subtriangular, compressed, more flattened on outer side and swollen on inner, edges coarsely serrated and edges of denticles serrated, outer edge deeply notched and convex on inner. Spiracle present, small, behind eye. First dorsal above space between pectorals and ventrals; second dorsal above anal. Caudal elongate, with double notch. Caudal pit basally above and below.

Tropical seas, ranging 70° or more from the Equator. Species few, large sharks with bars and stripes when young, uniform with age. Many fossils known from the Cretaceous and later.

GALEOCERDO CUVIER (Lesueur)

Squalus cuvier (Peron and Lesueur) Lesueur, Journ. Acad. Nat. Sci. Philadelphia, vol. 2, p. 351, 1822 (type locality: Northwest coast of New Holland).

Galeocerdo cuvier Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Squalus articus Faber, Nat. Fische Islands, p. 17, 1829 (type locality: Iceland).

Galeocerdo arcticus Müller and Henle, Syst. Beschr. Plagiostomen, p. 60, pl. 24, 1841 (Northern Seas, Iceland, Faroë Islands, Norway).—Gray, List fish British Museum, p. 54, 1851 (North Sea Islands, Faroë, Norway).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 394, 1865 (mers du nord).—Günther, Cat. Fishes British Mus., vol. 8, p. 377, 1870 (Arctic seas).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 148, pl. 43, figs. 6–8, 1913 (brain) (tropical and temperate seas to 70° or more from Equator).—Ogilby, Mem. Queensland Mus., vol. 5, p. 78, 1916 (Queensland coast; note).—Waite, Rec. South Australian Mus., vol. 2, p. 13, fig. 11, 1921.—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 27, 1925 (Natal coast).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—Fowler and Ball, Bishop Mus. Bull., 26, p. 4, 1925 (Laysan, Nihoa, Lisiansky, Gardner Islands).—Griffin, Trans. Proc. New Zealand Inst., vol. 58, p. 137, fig. 1, 1927.—McCulloch, Fishes of New South Wales, ed. 2, p. 6, pl. 1, fig. 11a, 1927.—Phillipps, New Zealand Journ. Sci. Techn., vol. 10, p. 226, fig. 8, 1928 (Bay of Islands).—Fowler, Mem. Bishop Mus., vol. 10, p. 19, fig. 5, 1928 (Honolulu, Laysan, Nihoa).—Tirant, Service Océanogr. pêches-Indo Chine, 6ᵉ note, p. 62, 1929 (Cochinchina).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 490, 1930 (East Indies, Japan, Hawaii, Atlantic); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).—Chevey, Inst. Océanogr. Indochine, 19ᵉ note, p. 6, 1932 (Indochina).—Giltay, Mem. Mus. Roy. Nat. Hist. Belge, Hors ser. 5, vol. 3, p. 12, 1933 (Dobo, Aru Island).—Fowler, Mem. Bishop Mus., vol. 11, No. 6, p. 386, 1934 (Ugi record); List Fish. Malaya, p. 10, 1938 (reference).

Galeus maculatus Ranzani, Nov. Comment. Acad. Sci. Bonon., vol. 1, p. 68, pl. 1, 1839 (type locality: Brazil).

Galeocerdo tigrinus Müller and Henle, Syst. Beschr. Plagiostomen, p. 59, pl. 23, 1841 (type locality: India, Pondicherry).—Gray, List fish British Museum, p. 54, 1851 (Indian Seas).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).—BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 36, 1860 (Calcutta).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 393, 1865 (mer des Indes; Pondicherry).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 378, 1870 (Japan; East Indies).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 663, 1871 (Koseir, Red Sea).—DAY, Fishes of India, pt. 4, p. 718, 1878 (Red Sea, India, Japan).—BRUSINA, Glasnik Naravosl. Družtva, vol. 3, p. 224, 1888 (Red Sea).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 3, 1888 (Ugi, Solomon Islands).—DAY, Fauna British India, Fishes, vol. 1, p. 21, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 39 ("Japan"), p. 128 (Nagasaki), 1901.—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 612, 1903 (Nagasaki).—FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 27, p. 940, 1904 (Oahu).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), pt. 1, p. 36, 1905 (Honolulu).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 61 (Padang material).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 483, 1910 (Hawaii).—SOUTHWELL, Ceylon Adminstr. Rep., 1912–13, p. E46 (description), p. E49.—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran and Oman). —PEARSON, Ceylon Administr. Rep., 1915–18, p. F12.

Galeus cepedianus AGASSIZ, Poissons Fossiles, vol. 3, p. 91 (230), pl. E, figs. 5–6, 1833–43 (teeth) (type locality: East Indies).

Carcharias (*Prionodon*) *fasciatus* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 510, 1852 (type locality: Batavia).

Galeocerdo fasciatus VAN KAMPEN, Bull. Dept. Agr. Ind. Néerl., vol. 8, p. 9, 1907.

Galeocerdo rayneri MACDONALD and BARROW, Proc. Zool. Soc. London, 1868, p. 368, pl. 32 (type locality: Australia, Lord Howe Island, Pacific).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 377, 1870 (India).—DAY, Fishes of India, pt. 4, p. 718, pl. 187, fig. 3, 1878 (India; Australia).—RAMSAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 95, 1880 (Port Jackson).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 353, 1881 (Port Jackson).—OGILBY, Cat. Fishes New South Wales, p. 1, 1886 (Solomon Islands); Cat. Fishes Australian Mus., vol. 1, p. 2, 1888 (Port Jackson); Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1768, 1889 (Australia; Solomons).—DAY, Fauna British India, Fishes, vol. 1, p. 20, fig. 3, 1889.—KENT, Naturalist in Australia, p. 193, 1897.—OGILBY, Handbook of Sydney, p. 117, 1898.—STEAD, Fishes of Australia, p. 232, 1908 (Port Jackson).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 591, 1913 (Lumakera; Lomblen).—ROBINSON, Natal Fisher. Rep., 1919, p. 50 (Natal).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 350, 1929 (Travancore).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference); Australian Zoologist, vol. 8, pt. 4, p. 216, 1937 (Middleton Reef).

Galeocerdo obtusus KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 664, 1871 (type locality: Koseir, Red Sea).—BRUSINA, Glasnik Naravosl. Družtva, vol. 3, p. 225, 1888 (Red Sea).

Galeocerdo hemprichii (Ehrenberg) KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 663, 1871 (name in synonymy).—HILGENDORF, Symbol. Physic. Hemprich-Ehrenberg, p. 8, pl. 5, fig. 3, 1899 (type locality: Red Sea).

Depth 7 to subcaudal origin; head 4, width 1⅓. Snout 3 in head; eye 6, 2 in snout, 3⅔ in interorbital; mouth width 2 in head with rather long outer fold; teeth with 18 to 20 rows in jaws, broad, compressed, margins finely serrated and 5 small cusps externally; nostrils little nearer front end of snout than mouth, with small flaps, internarial half mouth width; interorbital 1⅔ in head, convex. Third gill opening largest, last 2 over pectoral base.

Scales broadly though slightly trilobate, each with 3 ridges.

First dorsal origin close behind pectoral base, front fin edge 1½ in head; second dorsal length 2; anal length 2½; least depth of caudal peduncle 5⅔; pectoral 1¼, width 1⅘ its length, which 2⅓ to ventral; ventral length 2 in head; caudal nearly 2 in rest of body, subcaudal 2⅘ in caudal.

Slaty gray, paler below. In smaller examples upper surface of body and pectoral, also dorsal and caudal, variegated with deep leaden gray blotches, many on side of trunk more or less elongate and vertical.

Red Sea, Arabia, Natal, India, Ceylon, East Indies, Indo-China, China, Japan, North Australia, Queensland, New South Wales, South Australia, Western Australia, New Zealand, Lord Howe Island, Melanesia, Hawaii. In the Eastern Pacific in the Galapagos Islands and California. Also in the Atlantic. One, 3,050 mm., in the Queensland Museum from Moreton Bay.

1 example. A.N.S.P. Padang, Sumatra. A. C. Harrison and H. L. Hiller. Length, 995 mm.

Genus GALEORHINUS Blainville

Galeorhinus Blainville, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816. (Type, *Squalus galeus* Linnaeus, designated by Gill, Ann. Lyceum Nat. Hist. New York, vol. 7, p. 402, 1862.)

Galeus Schaeffer, Epistola Studii. Ichth., p. 20, 1760. (Atypic. Type, *Squalus galeus* Linnaeus).—(Klein) Walbaum, Artedi Pisc., vol. 3, p. 580, 1792. (Type, *Squalus galeus* Linnaeus.) (Inadmissible.)

Emissola Jarocki, Zoologia, vol. 4, p. 448, 1822. (Type, "l'Emissole"=*Squalus galeus* Linnaeus. Not consulted.)

Eugaleus Gill, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 148. (Type, *Squalus galeus* Linnaeus, orthotypic.)

Notogaleus Whitley, Australian Zool., vol. 6, p. 310, 1931. (Type, *Galeus australis* Macleay, orthotypic.)

Body moderately long, slender, cavity about one-half total length. Head moderate. Snout obtuse, depressed. Orbit longer than wide, with nictitating membrane. Mouth wide, crescentic, with short labial fold on each jaw. Teeth alike in two jaws, oblique, compressed, subtriangular, notched, inclined toward mouth angles, smooth on edges except two to four denticles on outer edge between notch and base. Last gill opening above pectoral. Spiracle small, behind eye. First dorsal above space between pectorals and ventrals; second dorsal above anal. Caudal rather short, with single notch; subcaudal lobe present, not very remote from notch behind subcaudal. No pit at caudal base.

Large to moderate or small smooth sharks, known as topes, feeding largely on fishes and found in most warm seas. Young about 20 to 40 in summer.

ANALYSIS OF SPECIES

a^1. Front nasal valve with 2 points; second dorsal and anal fins subequal.
  b^1. Fins largely uniform or like upper surface of body------------ australis
  b^2. Hind edges of dorsals and pectorals whitish, upper borders of dorsals and end of caudal dark-- galeus
a^2. Front nasal valve with rounded lobe; second dorsal much larger than anal; coloration of fins uniform------------------------------------ japanicus

GALEORHINUS AUSTRALIS (Macleay)

Galeus australis Macleay, Proc. Linn. Soc. New South Wales, vol. 6, pt. 2, p. 354, 1881 (type locality: Port Jackson).—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson; no description).—McCoy, Prodromus Zool. Victoria, vol. 1, dec. 7, pl. 64, fig. 2, 1882.—Ogilby, Edible Fishes New South Wales, p. 2, 1886; Cat. Fishes Australian Mus., vol. 1, p. 3, 1888 (Port Jackson); Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1769, 1889 (New South Wales north to Port Stephens).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 42, 1890 (passim).—Waite, Rec. Canterbury Mus., vol. 1, no. 1, p. 7, 1907 (reference).—Zietz, Trans. Roy. Soc. South Australia, vol. 32, p. 290, 1908 (compiled).—Ogilby, Proc. Roy. Soc. Queensland, vol. 21, p. 23, 1908 (Moreton Bay).—Waite, Rec. Canterbury Mus., vol. 1, no. 2, p. 9, pl. 15, 1909 (young) (New Zealand, Chatham Island in 13 to 105 fathoms).—McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 9, 1911 (Oyster Bay, Tasmania).—Regan, Brit. Antarctic *Terra Nova* Exped., Zool., vol. 1, pt. 1, no. 1, p. 14, 1914 (North Cape, New Zealand).—Ogilby, Mem. Queensland Mus., vol. 5, p. 78, 1916 (Moreton Bay).—Waite, Rec. South Australian Mus., vol. 2, p. 13, fig. 12, 1921.

Galeorhinus australis Ogilby, Handbook of Sydney, p. 117, 1898.—Waite, Mem. Australian Mus., vol. 4, p. 34, 1899 (New South Wales).—Hutton, Index Faunae New Zealand, p. 54, 1904.—McCulloch, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 459, pl. 37, figs. 5–7, 1921 (New South Wales); Fishes New South Wales, ed. 2, p. 6, fig. 1927.—Phillipps, New Zealand Journ. Sci. Techn., vol. 6, p. 259, fig. 2, 1924 (New Zealand).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—Young, Trans. New Zealand Inst., vol. 60, p. 140, 1929 (Chatham Island).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 490, 1930 (reference).

Mustelus australis Waite, Mem. New South Wales Nat. Club, no. 2, p. 7, 1904.

Eugaleus australis Waite and McCulloch, Trans. Roy. Soc. South Australia, vol. 39, p. 460, 1915 (Great Australian Bight, in 22 fathoms).

Notogaleus australis Whitley, Australian Zoologist, vol. 6, p. 310, 1931 (reference); Rec. Australian Mus., vol. 18, p. 324, figs. 3 a–c, 1932; Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Galeus canis (not Mitchill) Duméril, Hist. Nat. Elasmobr., vol. 1, p. 390, 1865 (coasts of New Holland).—Günther, Cat. Fishes British Mus., vol. 8, p. 379, 1870 (Tasmania).—Hector, Colonial Mus. Governm. Surv. Dept. (Fishes, New Zealand), p. 81, 1872.—Klunzinger, Arch. Naturg., vol. 38, p. 45, 1872 (Murray River); Sitzungsber. Akad. Wiss. Wien, math.-nat. Cl., vol. 80, pt. 1, p. 426, 1880 (Murray River).—Johnston, Proc. Roy. Soc. Tasmania, 1882, p. 137, 1883; 1890, p. 38, 1891.

Galeous canis CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 216, 1872 (Hobsons Bay).

Carcharinus cyrano WHITLEY, Australian Mus. Mag., vol. 4, pt. 3, p. 93, fig. of jaws, 1930 (type locality: New South Wales).

Depth ? to subcaudal origin; head 3½, width 1⅗. Snout 2 in head, as seen above rather attenuate and end rounded; eye 11, 5½ in snout, 5 in interorbital; dentary width 2¾ in head, length 1½ its width, with long upper labial groove twice length of lower; teeth triangular, edges entire, 38 rows above, 30 below; nostrils at last fourth in preoral space, internarial 1⅓ in dentary width; front nasal valve with 2 short points; interorbital 2⅓ in head, broad, slightly convex. Gill openings equidistant, last 2 above pectoral base and fifth shortest. Spiracle small slit about eye diameter directly behind eye.

Scales tricarinate, with 3 short points of which median longest.

First dorsal origin behind end of pectoral base, front edge 1⅘ in head, hind lobe ends in slender point; second dorsal origin slightly before anal origin, front edge 4⅞ in head, hind lobe ends in slender point behind; caudal longer than head, subcaudal lobe half fin length; pectoral width 1⅗ its length, which 1⅕ in head; ventral 2⅖.

Back and upper surfaces gray brown, paler to whitish below.

Queensland, New South Wales, Victoria, South Australia, Tasmania, New Zealand. In describing the Atlantic *Galeorhinus galeus* Garman says: "End of tail and upper border of dorsal darker," though they are uniform with the rest of the fins in my example of the present species.

U.S.N.M. No. 39972. Port Jackson. Australian Museum. Length, 1,420 mm. Head and body skinned out.

GALEORHINUS GALEUS (Linnaeus)

Squalus galeus LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 234, 1758 (type locality: European Ocean); ed. 12, vol. 1, p. 399, 1766.—SCHNEIDER, Syst. Ichth. Bloch, p. 128, 1801 (Atlantic, European, and Pacific Oceans).—CUVIER, Règne animal, vol. 2, p. 128, 1817 (reference).

Galeorhinus galeus BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816 (name only).—FOWLER, Mem. Bishop Mus., vol. 10, p. 19, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 490, 1930 (California; Atlantic Ocean); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 57, 1936 (Mediterranean; Azores).

Galeus galeus GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 482, 1910 (Europe, California, Cape of Good Hope, Hawaii).

Eugaleus galeus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 153, 1913 (Mediterranean, San Diego, Calif.).

Galeus vulgaris FLEMING, British Animals, p. 165, 1828 (British Isles).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 70, p. 19, 1901 (Laysan).

Galeus canis Bonaparte, Icon. Fauna Italica, Pesci, vol. 3, fasc. 8, description, pl. 3, 1834 (type locality: Italy).—Gray, List fish British Museum, p. 52, 1851 (Antarctic Exped., Indian Seas, Cape of Good Hope).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 390, 1865 (Cape of Good Hope, sea of Indies; not coasts of New Holland).—Günther, Cat. Fishes British Mus., vol. 8, p. 379, 1870 (Cape Seas, Indian and Antarctic Oceans).—? Elera, Cat. Fauna Filip., vol. 1, p. 614, 1895 (Luzon, Cavite, Santa Cruz).

Galeorhinus canis Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 28, pl. 1, fig. 3, 1925 (Cape Seas).

Galeus nilssoni Bonaparte, Cat. Metod. Pesci Europei, p. 19, 1846 (type locality: Northern Ocean). (No description; on *Squalus galeus* Bloch.)

Galeus communis Owen, Cat. Osteol., Roy. Coll. Surg. vol. 1, p. 92, 1853.

Galeus linnei Maim, Göteborgs Bohusl. Fauna, p. 618, 1877 (type locality: Göteborg).

Galeus zyopterus Jordan and Gilbert, U. S. Nat. Mus. Bull. no. 16, p. 871, 1883 (type locality: San Pedro, Calif.)

Galeus chilensis Perez, Estudios sobre algunos escualos de la costa de Chile, p. 3, 1886 (type locality: Chile).—Philippi, Anal. Univ. Chile, vol. 71, p. 543, pl. 4, fig. 2, 1887 (Valparaiso).

Galeus molinae Philippi, Anal. Univ. Chile, vol. 71, p. 544, pl. 4, fig. 1, 1887 (type locality: Valparaiso).

Depth 7 to subcaudal origin; head $4\frac{3}{5}$, width $1\frac{3}{5}$. Snout $2\frac{1}{5}$ in head; eye $4\frac{1}{2}$, $3\frac{1}{2}$ in snout; mouth width $2\frac{1}{3}$ in head, labial folds around mouth angles not extending half way to symphysis and lower shorter; preoral length $2\frac{1}{4}$ in head; about 44 rows of upper teeth, mostly tricuspid, outer cusp of each lateral tooth best developed; nostrils rather large, internarial half mouth width, placed at last $\frac{2}{7}$ in snout; interorbital $2\frac{1}{5}$, broad, little convex, depressed medially. Gill openings subequal, third and fourth largest, last 2 over pectoral base. Spiracle small, close behind eye.

First dorsal origin behind end of pectoral base, fin closer to pectorals than ventrals, front fin edge $1\frac{4}{5}$ in head; second dorsal length $2\frac{1}{6}$; anal length $2\frac{1}{4}$, fin origin slightly behind second dorsal origin; front edge of subcaudal $1\frac{1}{2}$ in head; least depth of caudal peduncle 5; pectoral length $1\frac{1}{4}$, width half its length, which $2\frac{1}{4}$ to ventral; ventral length $2\frac{1}{8}$; caudal $3\frac{1}{5}$ in rest of body.

Gray-brown, below white. Dorsals dusky above, whitish posteriorly. End of caudal dusky, subcaudal with pale border. Pectoral dusky above, grayish below.

South Africa, Melanesia, Polynesia, Hawaii. Reported from the Philippines by Elera. Also found in the Eastern Pacific in California, Lower California, Peru and Chile. Widely distributed in the Atlantic.

A.N.S.P. Nos. 605–608. Italy. C. L. Bonaparte collection (No. 254). Length, to 450 mm.

A.N.S.P. No. 582. San Francisco, Calif. U. S. Fish Commission (No. 27190). Length, 324 mm. Cotype of *Galeorhinus zyopterus*.

GALEORHINUS JAPANICUS (Müller and Henle)

Galeus japanicus MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 58, pl. 22, 1841 (type locality: Japan).—GRAY, List fish British Museum, p. 53, 1851 (Japan).—PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 687, 1908 (Nagasaki).

Galeus japonicus DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 391, 1865 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 380, 1870 (compiled).—WEBER, *in* Semon's Zool. Forsch. Reis. Australia, vol. 5, p. 276, 1895 (Ambon).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 611, 1903 (Onomichi, Hiroshima, Nagasaki).—JORDAN and THOMPSON, Mem. Carnegie Mus., vol. 4, p. 162, 1909 (Formosa record).

Galeorhinus japonicus BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 21, 1853 (Japan); (Japan), vol. 26, p. 44, 1857 (Japan).—NYSTRÖM, Bihang. Kong. Svenska Vet. Akad. Handl. Stockholm, vol. 13, pt. 4, no. 4, p. 50, 1887 (Nagasaki).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 39 (Yokohama), p. 128 (reference), 1901.—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus., Vertebrata, p. 190, 1920 (Hizen).

Galeorhinus japanicus JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 318, 1902 (Formosa).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 105, 1925 (Miyazu and Osaka market).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 490, 1930 (Japan).

Eugaleus japanicus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 154, 1913 (Japan).

Depth 8¼ to subcaudal origin; head 5⅓, width 1⅔. Snout 2⅕ in head; eye 6, 2⅗ in snout; mouth width 2, length ⅓ its width, labial fold around each mouth angle, upper nearly halfway to symphysis, lower much shorter; teeth with 2 strong denticles on outer edge; nostrils much nearer mouth than snout end, or midway between snout end and mouth angles, internarial 1⅘ in mouth width; front nasal lobe broad and rounded; interorbital low. Gill openings equidistant, last 2 over pectoral base. Spiracle very small, close behind eye.

Scales tridentate, median point largest, each with 3 low keels.

First dorsal begins behind inner pectoral angles, front edge 1½ in head; second dorsal front edge 1⅔; front anal edge 2¼, fin origin opposite first fourth in second dorsal base; least depth of caudal peduncle 5½ in head; pectoral 1, width 2⅒ its length, which 1¾ to ventral; ventral length 2, clasper slender, pointed; caudal 4 in rest of body, front subcaudal edge 2⅖ in caudal.

Gray, paler below. (Müller and Henle.)

Formosa, Japan. Reported from Amboina by Weber. The head of a huge specimen was seen by Jordan in Nagasaki, and Jordan and Fowler state that it reaches a length of 6,625 mm. (25 feet) and a weight of nearly 2,000 pounds.

Genus HEMIPRISTIS Agassiz

Hemipristis AGASSIZ, Poissons fossiles, vol. 1, p. 8, 1833 (nomen nudum); vol. 3, pp. 237, 302, 1843. (Type, *Hemipristis serra* Agassiz, designated by Woodward, Cat. Fossil Fish. Brit. Mus., vol. 1, p. 450, 1889.)

Dirrhizodon Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 664, 1871. (Type, *Dirrhizodon elongatus* Klunzinger, monotypic.)

Body elongated, slender. Head with slightly convex profile. Snout rounded in front, little wider than long. Teeth elevated, triangular, mostly curved or inclined backward, toward apex both coronal edges becoming coarsely serrated; root divided into two divergent branches; upper teeth relatively large, broad, flat; front lower teeth slender, subulate, curved inward, without denticles or only one or two minute basal points. Nasal flap distinct. Interorbital level. Gill openings wide. Spiracle one-fourth of eye, one diameter behind eye. First dorsal close behind pectoral base; second dorsal over anal. Caudal with upper lobe much longer, notched near end. Pectorals moderate.

One species known from the Red Sea and several from Cretaceous and later formations.

HEMIPRISTIS ELONGATUS (Klunzinger)

Dirrhizodon elongatus Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 665, 1871 (type locality: Red Sea).—Brusina, Glasnik Naravosl. Družtva, vol. 3, p. 225, 1888 (Red Sea).

Depth 9; head 6, width 1. Snout 3½ to 4 in head, ½ to ⅓ postocular part of head; front of lower lip with lobe and upper lip with 3 grooves from angle; teeth in 13+13 rows, mostly 6 rows inside; interorbital 5. Last gill opening above pectoral, each gill opening 3 times high as eye.

Scales with 3 to 5 keels.

First dorsal begins above hind angle of pectoral; second dorsal moderate, 2 to 2½ times lower than first dorsal; anal somewhat smaller, begins below middle of second dorsal; caudal length nearly equal to both dorsals, upper lobe 3 times longer than lower and subcaudal very curved; pectoral not quite twice long as high, not smaller than first dorsal, similar and deeply concave; angles of all fins pointed.

Back slate-gray. Belly white. Fins gray, hind tips of anal white. Length, 2.3 m. (Klunzinger.)

Red Sea.

Genus TRIAENODON Müller and Henle

Triaenodon Müller and Henle, Sitz. Ber. Akad. Wiss. Berlin, 1937, p. 117. (Atypic: Type, *Carcharias obesus* Rüppell; Arch. Naturg., 1837, pt. 1, p. 396. Atypic: Type, *Carcharias obesus* Rüppell, Syst. Beschr. Plagiostomen, p. 55, 1841. Type, *Carcharias obesus* Rüppell, designated by Jordan, Genera of Fishes, pt. 2, 192, 1919.)

Body rather slender, tapers to head and tail. Head wide, narrows forward from broad convex crown. Snout short, wide, depressed. Eyes small, lateral with nicitating membrane. Mouth wide, greatly arched, labial folds rudimentary. Teeth small, equal, numerous, with stronger median cusp and 1 or 2 small lateral cusps. Nostrils nearer mouth than snout end, front valves folded inward with appearance as if double, with short rounded lobe. Last gill openings above pectoral. No spiracles. Scales small, with 3 to 7 keels. First dorsal above space behind pectorals. Second dorsal above anal. Caudal with pit at root above, subcaudal lobe well developed.

TRIAENODON OBESUS (Rüppell)

Carcharias obesus Rüppell, Neue Wirbelth., Fische, p. 64, pl. 18, fig. 2, 1835 (type locality: Djedda, Red Sea).

Triaenodon obesus Müller and Henle, Syst. Beschr. Plagiostomen, p. 55, pl. 20, 1841 (Indian Ocean, Red Sea).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 80, 1853 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 386, 1865 (Red Sea).—Günther, Ann. Mag. Nat. Hist., ser. 3, vol. 20, p. 67, 1867 (Red Sea; Aneiteum); Cat. Fishes British Mus., vol. 8, p. 383, 1870 (Seychelles; Aneiteum, New Herbrides).—Klunzinger, Verh. zool. bot. Ges. Wien, vol. 21, p. 617, 1871 (Red Sea).—Peters, Monatsb. Akad. Wiss. Berlin, 1875, p. 447, 1876 (Seychelles).—Meyer, Anal. Soc. Españ. Hist. Nat. Madrid, vol. 14, p. 48, 1885 (Misol).—Gorgoza, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 74, 1885 (Manila).—Brusina, Glasnik Naravosl. Družtva, vol. 3, p. 226, 1888 (Rea Sea).—Day, Fauna British India, Fishes, vol. 1, p. 25, 1889 (probably off India).—Elera. Cat. Fauna Filip., vol. 1, p. 615, 1895 (Luzon, Manila Bay).—Günther, Journ. Mus. Godeffroy, pt. 17, p. 482, 1910 (Misol, Macassar, Aneiteum, Tahiti).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 163, 1913 (Red Sea and Indian Ocean).—Weber, *Siboga* Exped., Fische, vol. 57, p. 592, 1913 (Makassar, Daanar, Northwest Waigiu).—Fowler and Ball, Bishop Mus. Bull. 26, p. 4, 1925 (Laysan, Lisiansky and Wake Islands).—Fowler, Mem. Bishop Mus., vol. 10, p. 22, fig. 7, 1928 (Laysan example); Proc. 4th (1929) Pacific Sci Congr., Java, p. 489, 1930 (Laysan).

Trioenodon obesus Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).

Leptocharias obesus Gray, List fish British Mus., p. 51, 1851 (reference).

Triaenodon obtusus Day, Fishes of India, pt. 4, p. 720, pl. 189, fig. 3, 1878 (type locality: Kurrachee); Fauna British India, Fishes, vol. 1, p. 25, 1889 (fig. 6 copied).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 163, 1913 (copied).—Pearson, Ceylon Administr. Rep., 1914, p. E4.

Eulamia odontaspis Fowler, Proc. Acad. Nat. Sci., Philadelphia, 1908, p. 63, fig. 2 (type locality: probably Indian Ocean).

Depth 4⅘ to 4⅞ to subcaudal origin; head 4⅗ to 4¾, width 1⅖ to 1⅔. Snout 2¾ to 3 in head, broadly obtuse with rounded profile as seen from above; eye 5⅕ to 5¾ in head, 1⅘ to 2 in snout, 3 to 3¼ in interorbital, depth ⅗ its length; dentary width 2¼ to 2⅗ in head, length ⅘ its width, preoral 1⅔ to 1¾ in dentary width, labial fold very short and not extended along jaws; dentition undeveloped; nostrils nearer mouth than snout end, about 2¼ in internarial space, front nasal valve moderate triangular flap and hind valve rather narrowed triangular flap; interorbital 1⅗ to 1⅔ in head, broad, convex. Gill openings narrow, about equally spaced, last deepest and above pectoral.

Scales small, mostly as smooth tubercles (young).

First dorsal origin midway between hind basal edge of pectorals and ventral origins, length 1⅛ to 1⅕ in head, hind lobe ends in short, narrow, triangular point; second dorsal similar, origin little nearer ventral origin than subcaudal origin, length 1⅔ to 2 in head; subcaudal height 1¼ to 1⅓, 2⅛ to 2⅕ in caudal length; least depth of caudal peduncle 4¼ to 5⅕ in head; pectoral length 1⅕, width 1¾ its length; ventral length 2 to 2⅗.

Light cinnamon brown generally, paler below. Fins all more or less darker terminally. Though neither species with white tips to fins, first dorsal and caudal tips paler than rest of fin.

Red Sea, Arabian Sea, Madagascar, Seychelles, India, Ceylon, East Indies, Philippines, Melanesia, Polynesia, Hawaii.

U.S.N.M. No. 6688. Bonin Islands. William Stimpson. Length, 280–286 mm. Two examples.

Genus LEPTOCHARIAS Müller and Henle

Leptocharias (Andrew Smith) MÜLLER and HENLE, Ann. Mag. Nat. Hist. Charlesworth, vol. 2, p. 36, 1938. (Atypic: Type, *Triaenodon smithii* Müller and Henle.)

Leptocarias (Andrew Smith) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 56, 1841. (Type, *Triaenodon smithii* Müller and Henle. "Typus der Gattung *Leptocarias* Smith".)

Leptocarcharias GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 384, 1870. (Type, *Triaenodon smithii* Müller and Henle, orthotypic.)

Body elongate, rather slender. Head short. Snout produced, rounded at end. Eye with nictitating membranes. Mouth large, greatly arched, labial folds long. Teeth equal, small, numerous, alike in jaws, with longer median cusp and 1 to 3 smaller lateral cusps at each side on base. Nostrils nearer mouth than snout end, front nasal valve with elongate lobe. Last gill opening above pectoral base. First dorsal above space between pectorals and ventrals. Second dorsal above anal. Caudal without pit at root, small subcaudal undeveloped.

Though known only from the West African coast Barnard suggests it may eventually be also found in South Africa. Jordan gives "*Leptocarias* Smith: Ill. S. Af. Zool.; orthotype *Triaenodon smithi* Gray," but on turning to that work I fail to find it there.

LEPTOCHARIAS SMITHII (Müller and Henle)

Triaenodon smithii MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 56, pl. 21, 1841 (type locality: Kabenda Bay, West Africa).—BLEEKER, Nat. Tijdschr. Nederland Indië, vol. 21, p. 57, 1860 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 387, 1865 (compiled).

Leptocharias smithii Gray, List fish British Museum, p. 51, 1851 (type).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 164, 1913 (compiled).—Fowler, Copeia, No. 1, p. 21, 1930 (note on identity of *Mustelus osborni*); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 59, fig. 15, 1936 (type of *Mustelus osborni*).

Leptocarcharias smithii Günther, Cat. Fishes British Mus., vol. 8, p. 384, 1870 (type locality given as "South Africa").

Leptocarcharias smithi Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 28, 1925 (compiled).

Mustelus osborni Fowler, Amer. Mus. Nov., No. 103, p. 1, 1923 (type locality: Mouth of the Congo).

Depth 10⅘ to subcaudal origin; head 6⅖, width 1½. Snout 2 in head; eye 9½, 4¾ in snout, 5 in interorbital; mouth width 2¾ in head, long as broad; preoral length 1⅖ in mouth; teeth small, alike in jaws, with median longer cusp and 1 or 2 smaller basal cusps, all decreasing in size toward mouth angles; small median erect lower tooth; nostrils behind middle in snout length, much closer to mouth than snout end, front valve with long, slender, pointed lobe, internarial 1¼ in preoral length; interorbital 1¾ in head, rather low. Gill openings equidistant.

Scales minute, tridentate, median point longest.

First dorsal origin opposite depressed pectoral tip, front fin edge equals head measured to second gill opening; second dorsal front edge very slightly less than head to first gill opening; anal origin opposite first third of second dorsal base, front fin edge 1¾ in head; pectoral 1⅒, width 1⅗ its length; ventral length 1⅓, slender clasper long as fin; caudal 4⅕ in rest of body, subcaudal 3 in caudal.

Gray brown, paler below. (Müller and Henle.)

West Africa. Barnard gives its length as 550 mm.

A.M.N.H. No. 8281. Mouth of the Congo. Messrs. H. Lang and J. H. Chapin. Length, 752 mm. Type of *Mustelus osborni*.

Genus TRIAKIS Müller and Henle

Triakis Müller and Henle, Ann. Mag. Nat. Hist. Charlesworth, vol. 2, p. 86, 1838. (Atypic: Type, *Triakis scyllium* Müller and Henle; Syst. Beschr. Plagiostomen, p. 63, 1841. Type, *Triakis scyllium* Müller and Henle, monotypic.)—Agassiz, Nomenclat. Zool., Index, p. 375, 1846.

Triacis Günther, Cat. Fishes British Mus., vol. 8, p. 348, 1870. (Type, *Triakis scyllium* Müller and Henle. Emendation.)

Rhinotriacis Gill, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 486. (Type, *Rhinotriacis henlei* Gill, monotypic.)

Calliscyllium Tanaka, Fishes of Japan, vol. 10, p. 17, 1912. (Type, *Calliscyllium venustum* Tanaka, monotypic.)

Hemitriakis Herre, Philippine Journ. Sci., vol. 23, p. 70, 1923. (Type, *Hemitriakis leucoperiptera* Herre, monotypic.)

Body elongate. Head depressed, flattened below. Snout obtuse. Eye small, with nictitating fold. Mouth arched, labial folds and cartilages well developed. Teeth small, numerous, bases with 2 roots, each tooth with stronger median cusp and at each side of base denticle or denticles. Front nasal valve with rounded lobe. Last gill openings above pectoral base. Spiracles small, behind eyes. First dorsal above space between pectorals and ventrals. Second dorsal above anal. Caudal short, no pit at origin and notch behind small subcaudal.

Small sharks, without caudal pits and often blotched or spotted.

ANALYSIS OF SPECIES

a^1. TRIAKIS. Internarial more than half preoral length; outer fin edges concave.
  b^1. Coloration uniform brownish---------- leucoperiptera
  b^2. Coloration brown, with darker obscure cross bands and scattered black spots---------- scyllium
a^2. CALLISCYLLIUM. Inner internarial ⅓ outer internarial width, less than half preoral length; outer fin edges scarcely concave; coloration greatly variegated with small dark spots over upper surface of body---------- venusta

Subgenus TRIAKIS Müller and Henle

TRIAKIS LEUCOPERIPTERA (Herre)

Hemitriakis leucoperiptera HERRE, Philippine Journ. Sci., vol. 23, p. 71, pl. 1, 1923 (type locality: Dumaguete, Philippines); Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped., 1931, p. 12, 1934 (Dumaguete).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 14, 1937 (reference).

Triakis leucoptera FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 490, 1930 (reference). (Error.)

Depth 5⅔ to 7⅔ to subcaudal origin; head 4 to 5⅛, width about 1¼. Snout 2⅖ to 2½ in head; eye 4 to 5¾, 1⅞ to 2⅓ in snout, trifle less than 2 in interorbital; mouth width 2½ in head, length 2½ its width, labial folds large, upper longer than lower or about ⅖ upper jaw; teeth in 18 rows above, 34 below, strongly oblique with longer sharp pointed cusp and 2 or 3 much smaller denticles on outer side; lower median teeth with no to 3 small basal denticles each side; remaining rows of teeth smaller than opposing upper teeth, strongly oblique, with larger cusp directed toward mouth angle and 1 to 4 minute cusps on denticles on outer side; nostrils about midway in preoral, each front valve with outer triangular pointed flap near inner angle of nostril and under and at right angles smaller dividing fold or flap, internarial 1¾ in preoral length; interorbital low. Gill openings with third largest, last smallest, last 2 over pectoral.

First dorsal origin before hind inner pectoral angle, front fin edge 1¼ to 1½ in head; front edge of second dorsal 1½ to 1¾; front anal edge 2¼ to 2⅔, origin below middle of second dorsal base; least depth of caudal peduncle 5¾ to 6; ventral length 1⅖ to 2⅕; pectoral 1 to 1½, width 1⅞ its length, which reaches nearly opposite hind first dorsal basal edge with age; caudal 3 to 3¾ in rest of body, subcaudal 2½ to 2⅔ in caudal or 1⅘ to 2 in head.

Nearly uniform dark gray-brown above lateral line, darkest on crown, snout and predorsal. Paler below, whitish or with yellowish cast beneath. Fins with narrow, white, hind edges. Length, 955 mm. (Herre.)

Philippines. Known only from the type, containing 12 young 200–218 mm. long.

TRIAKIS SCYLLIUM Müller and Henle

Triakis scyllium Müller and Henle, Syst. Beschr. Plagiostomen, p. 63, pl. 26, 1841 (type locality: Japan).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 24, p. 121, 1853 (Japan).—Brevoort, Narr. Exped. China Japan, Perry, vol. 2, p. 285, pl. 12, fig. 1, 1956 (Simoda).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 26, p. 42, 1857 (Japan).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 397, 1865 (compiled).—Steindachner, Ann. Hofmus. Wien, vol. 11, p. 224, 1896 (Kobe, Hiogo, Nagasaki).—Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 336, 1900 (Tokyo); Annot. Zool. Japan, vol. 3, p. 39 (127), 1901 (Yokohama).—Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 318, 1902 (Formosa).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 609, 1903 (Tokyo, Tsuruga, Onomichi, Hakata).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 689, 1908 (Japan).—Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 400, 1912 (Tokyo; Misaki).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 166, 1913 (Japan).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 190, 1920 (Tokyo).—Waite, Rec. South Australian Mus., vol. 2, p. 20, fig. 25, 1921 (St. Vincent Gulf).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Jensen, Korea).—Wu, Contrib. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 7, fig. 5, 1929 (Amoy).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 8, 1930 (Far East Seas).—Fowler, Hong Kong Naturalist, vol. 1, p. 80, fig. 9, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 490, 1930 (Japan).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 229, fig. 6, 1932 (Chefoo).—Tanaka, Jap. Fish. Life Colours, No. 13, 1933.—Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 91, 1933 (Chusan).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Triacis scyllium Günther, Cat. Fishes British Mus., vol. 8, p. 384, 1870 (compiled).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 62, 1897.

Triacis semifasciata (not Girard) Günther, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 154, 1874 (Chefoo).

Depth 6⅗ to 7¾ to subcaudal lobe origin; head 4½ to 4⅗, width 1½ to 1⅗. Snout 2½ to 2⅗ in head, rounded, obtuse; eye 5¾ to 6½, 2⅕ to 2½ in snout, 2¾ to 3 in interorbital, depth ⅔ its length; dentary width 2⅞ to 3 in head, length ⅖ its width, labial grooves deep on each jaw, upper slightly longer and both slightly less than half of each jaw; teeth in 40 rows above, 36 rows below, each with narrow median triangular cusp and 1 or 2 small basal cusps each side, edges entire; nostrils at last third in preoral, front valve wide, its width 1⅘ in internarial space; interorbital 2⅕ to 2⅓ in head, broad, little convex. Gill openings with second to fourth subequally longest, fourth and fifth closer than others and above pectoral base. Spiracles small, level with and ½ diameter behind eye.

Scales small, as simple, narrow triangular, tricarinate cusps, rough velvety to touch.

First dorsal origin opposite hind edge of depressed pectoral, length 1¼ to 1⅓ in head, hind lobe rather short narrow triangular point; second dorsal origin little before anal origin or at last fifth in space between ventral and anal origins, length 1¼ to 1⅖ in head, like first dorsal; anal origin opposite first third of second dorsal or opposite middle of second dorsal, length 1½ to 2⅒ in head; subcaudal equals head, 1⅓ to 1⅖ in caudal length; least depth of caudal peduncle 4½ to 5 in head; pectoral 1⅕ to 1¼, width 1⅗ to 1⅘ its length; ventral 1¾ to 1⅞ in head.

Back and upper surface gray to dark mauve brown, under surfaces of head, body, and tail whitish. Ten diffuse dark bands on head above and back, with few variable scattered dusky or slate black spots also over back and sides. In some examples few whitish or gray spots scattered over head and back. Under surfaces of paired fins grayish.

China, Formosa, Korea, Japan, South Australia. The dark spots on the body are subject to great variation, though most always quite small. While never absent they are variously obscure or even greatly contrasted.

U.S.N.M. No. 22607. Awa, Japan. Japanese Government. Length 473 mm. Depth 7 to subcaudal origin; head 5, width 1⅓. Snout 2¼ in head, rather broadly convex as seen from above; eye 6¼, 2⅖ in snout, 2⅘ in interorbital, depth half its length; dentary width 2¾ in head, length 2¼ its width, with moderate, deep fold around each angle, of which upper little longer or somewhat less than half each half of upper jaw, also groove extends from mouth angle to divide labial folds; teeth in 36 rows above, 32 rows below. As *Carcharias japonicus*.

U.S.N.M. No. 50726. Tokyo. Jordan and Snyder. Two examples. Length, 233 to 295 mm.

U.S.N.M. No. 71711. Misaki, Japan. *Albatross* collection, 1906. Length, 298 mm.

U.S.N.M. No. 71712. Misaki. *Albatross* collection, 1906. Length, 368 mm.

U.S.N.M. No. 71765. Misaki. *Albatross* collection (0273). Length, 254 mm.

U.S.N.M. No. 71767. Tokyo. *Albatross* collection (0476). Length, 305 mm.

U.S.N.M. No. 71771. Tokyo. *Albatross* collection (0483). Length, 289 mm.

U.S.N.M. No. 71772. Misaki. *Albatross* collection (0609). Length, 308 mm.

U.S.N.M. No. 71773. Misaki. *Albatross* collection (0888). Length, 326 mm.

Subgenus CALLISCYLLIUM Tanaka

TRIAKIS VENUSTA (Tanaka)

Calliscyllium venustum TANAKA, Fishes of Japan, vol. 10, p. 171, pl. 46, figs. 178–183, 1912 (type locality: Tokyo market, Japan).—SCHMIDT, Compt. Rend. Acad. Sci. U. S. S. R., 1928, p. 65, figs. 1–3 (teeth, fins, etc.) (Okinawa; RiuKiu).—TANAKA, Jap. Fish. Life Colours, No. 6, 1933.

Triakis venusta GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 456, 1913 (Sagami Sea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr. Java, p. 490 (reference), 1930.

Depth 9⅖ to subcaudal origin; head 7, width 1¼. Snout 2⅗ in head; eye 4, 1⅔ in snout, 2 in interorbital; mouth width 2 in head, length 2⅕ its width or 1½ in preoral, labial folds short; teeth small, subequal, slightly inclined outward, with larger median and 2 or 3 lateral cusps each side; nostrils about last third in preoral length, internarial about ⅓ in width between outer nasal borders; interorbital 2⅓ in head, low. Last 2 gill openings closer, above pectoral.

Scales small, each with median keel ending in point behind, slight obtuse point widely each side.

First dorsal origin much nearer ventral origin than pectoral, front fin edge 1 in head; front second dorsal edge 1; front anal edge 2, origin little before second dorsal origin; least depth of caudal peduncle 4¼ in head; pectoral 1, not reaching dorsal origin, width 1½ its length; ventral length 1½ in head; caudal $3\frac{9}{10}$ in rest of body, front subcaudal edge 3¼ in caudal length or 1⅘ in head.

Light sepia, pale beneath. Numerous dark brown spots, irregularly scattered on upper parts of body and fins except anal and under surface of pectoral and ventral. About 17 indistinct clouded like saddles on back. Length, 645 mm. (Tanaka.)

Japan. The type No. 3398, Science College Museum, Tokyo.

Genus ERIDACNIS H. M. Smith

Eridacnis H. M. SMITH, Proc. U. S. Nat. Mus., vol. 45, p. 599, 1913. (Type, *Eridacnis radcliffei* H. M. Smith, orthotypic.)

Body elongate, rather slender, compressed. Head moderate. Eye with nictitating membrane. Mouth wide, angular, without labial folds. Teeth small, erect, pluricuspid, alike in jaws. Gill openings rather narrow, last 2 or 3 above pectoral. Spiracle moderate, close behind eye. Scales tridentate. Dorsals subequal, first entirely before ventrals. Anal opposite second dorsal, much smaller. No caudal pits. Caudal long, nearly straight, notch near tip, subcaudal little distinct. Pectorals rounded.

Small, deep water, viviparous sharks. One species. Differs from *Triakis* chiefly in the absence of labial folds.

ERIDACNIS RADCLIFFEI H. M. Smith

Eridacnis radcliffei H. M. SMITH, Proc. U. S. Nat. Mus., vol. 45, p. 599, pl. 47, 1913 (type locality: Off Jolo, Sulu Islands, in 161 fathoms).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 490, 1930 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull 6, p. 14, 1937 (reference).

Depth 5⅓ to 5⅘ to subcaudal origin; head 4 to 4⅖, width 1¼ to 1½. Snout 2⅞ to 3 in head; eye 3½ to 4, 1 to 1¼ in snout, 1½ to 1⅗ in interorbital; mouth width 2⅛ to 2⅕ in head, gape 1⅓ to 1½ its width, form nearly equilateral triangle, without folds or grooves at corners; upper jaw with about 60 rows of fine, tricuspid teeth, edges of all entire and median cusp largest, narrowly triangular; nostril ⅔ to ¾ long as eye, internarial less than nostril length, 1¾ to 2⅕ in preoral length, which 2⅘ to 3⅛ in head; interorbital 2⅓ to 2⅘, broadly and slightly convex. Last gill opening smallest, nearer fourth than width of other interspaces. Spiracle rather large, close behind lower eye edge.

Scales minute, tridentate, median point longest and with median keel. Caudal without pits.

First dorsal origin little nearer second dorsal origin than snout tip, fin length 1 to 1⅛ in head; second dorsal length 1⅒ to 1¼; anal length 1⅕ to 1¼, origin opposite to slightly in advance of second dorsal origin; caudal 2⅛ to 2½ in rest of body, subcaudal length 1⅕ to 1¼ in caudal length; least depth of caudal peduncle 4 to 4¼, in head; pectoral 1⅙ to 1¼, width 1⅕ to 1⅓ in its length; ventral length 1⅓ to 1⅗ in head.

Upper surface gray brown, under surfaces pale to whitish. Caudal with 4 obscurely defined slightly darker broad bandlike blotches, much wider than pale interspaces. Young with hind portions of dorsals whitish.

Philippines.

D. 5135. Balukbaluk Island (North) S. 59° W., 6.25 miles (6° 44′ 45″ N., 121° 48′ E.), Sulu Archipelago, near Basilan Island. February 7, 1908. Length, 110 to 228 mm. 2 examples.

3301 to 3304, 3665. D. 5403. Capitancillo Island Light, S. 46° W., 15.7 miles (11° 10′ N., 124° 17′ 15″ E.), between Leyte and Cebu. March 16, 1909. Length, 119–190 mm. 5 examples.

1716. D. 5503. Macabalan Point Light (Mindanao), S. 31° E., 6.6 miles (8° 36′ 26″ N., 124° 36′ 08″ E.). August 4, 1909. Length, 120 mm.

1954, 1962. D. 5518. Port Tagolo Light, S. 64° W., 8.7 miles (8° 48′ N., 123° 31′ E.), Mindanao. August 9, 1909. Length, 213–234 mm. 2 examples.

1530. D. 5537. Apo Island (C.), S. 26° W., 11.8 miles (9° 15′ 45″ N., 123° 22′ 00″ E.), between Negros and Siquijor. August 19, 1909. Length, 242 mm.

Genus MUSTELUS Linck

Mustelus LINCK, Mag. Phys. Naturg. Gotha, ser. 3, vol. 6, p. 31, 1790. (Type, *Squalus mustelus* Linnaeus, monotypic.)

Mustelus VALMONT, Dict. Hist. Nat. Poiss., vol. 3, p. 138, 1768; vol. 12, p. 523, 1769. [Type, *Galeus stellatus* Valmont=*Squalus mustelus* Linnaeus (inadmissible).]—RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 126, 1826. (Type, *Squalus mustelus* Linnaeus.)

Mustellus FISCHER-WALDHEIM, Zoognosia, ed. 3, vol. 1, p. 78, 1813. (Type, *Squalus mustelus* Linnaeus.)

Myrmillo GISTEL, Naturg. Theirreichs, p. x, 1848. (Type, *Squalus mustelus* Linnaeus, virtually.) (*Myrmillo* Gistel proposed to replace *Mustelus* Linck.)

Pleuracromylon Gill, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 148. (Type, *Mustelus laevis* Risso, orthotypic.)

Cynias Gill, Proc. U. S. Nat. Mus., vol. 25, p. 960, 1903. (Type, *Squalus canis* Mitchill, orthotypic.)

Cynais Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 55. (Type, *Squalus canis* Mitchill.) (Error.)

Body slender, nearly long as tail. Head short, depressed, wide, tapers in front, wider and flattened below. Snout long, depressed, produced, and rounded. Eye large, ellipsoid, lateral, lower lid with nictitating fold. Mouth crescentic, subangular, rounded anteriorly, labial folds well developed. Teeth small, numerous, polyserial, flat, smooth or with shallow notches or low cusps, rhombic, pavementlike, alike in jaws. Nostrils large, well separated, without groove to mouth, front valve produced in outer angle. Spiracle small, close behind eye. Dorsals alike. First dorsal large and above abdomen, close behind pectorals, second dorsal above anal, which smaller. Tail nearly straight, lower lobe almost obsolete, without pits. Pectorals large.

Small sharks found in most cool seas, their food usually crustaceans, mollusks, and small fish. They have been divided into two groups, based on the presence or absence of the placental attachment in the embryo. This has evidently evolved by means of vascular folds of the umbilical sac of the embryo attaching with membranes lining the so-called uterus. This then functions as a sort of pseudoplacenta in which nutritive matter is diffused with maternal blood to the foetus, as in higher animals.

Cynias kanekonis Tanaka [4] is described in Japanese.

ANALYSIS OF SPECIES

a^1. Pleuracromylon. Coloration usually uniform, without spots.
  b^1. First dorsal origin behind inner pectoral origin .... lenticulatus
  b^2. First dorsal origin opposite inner pectoral angle; teeth without extended cusp, slightly concave on inner edge .... antarcticus
  b^3. First dorsal origin forward of inner pectoral angle; teeth with notches or denticles .... canis
a^2. Mustelus. Coloration variegated with dark or light spots.
  c^1. Usually spotted with white.
    d^1. First dorsal origin above inner pectoral angle .... manazo
    d^2. First dorsal origin opposite pectoral axil .... mustelus
  c^2. Usually spotted with black; first dorsal origin behind inner pectoral angle .... punctulatus

Subgenus PLEURACROMYLON Gill

MUSTELUS LENTICULATUS Phillipps

Mustelus lenticulatus Phillipps, New Zealand Journ. Sci. Tech., vol. 13, p. 226, 1932 (type locality: Wellington Harbor).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

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[4] Dobuts. Zasshi Tokyo, vol. 28, p. 26, 1916 (type locality: Japan).

Mustelus antarcticus (not Günther) PHILLIPPS, New Zealand Journ. Sci. Tech., vol. 6, p. 263, fig. 7, 1924 (New Zealand) ; Bibl. New Zealand Fish., Fisher. Bull. 1, p. 8, 1927.

Snout to pectoral origin 5⅖ in total length, equals distance from hind tip of first dorsal to origin of second dorsal. First 3 gill slits slightly increase in size backward and last 2 decrease considerably. Dorsal origin halfway between snout tip and second dorsal origin, just behind rounded inner edge of pectoral, and hind dorsal lobe reaches nearly to ventral, which much nearer snout than tip of tail. Anal reaches over one-third and under half distance from its base to caudal origin. Upper caudal lobe measured obliquely equals distance from snout to last gill opening. (Phillipps.)

New Zealand. Said to differ from *Mustelus antarcticus* in its spotted body, prenasal space 3¾ in head to first gill slit (compared with 3), gills increasing in size backward to third which largest and then suddenly decreasing (compared with gills decreasing backward or first 2 largest), upper caudal lobe equals space from snout to last gill opening (compared with same space much less in *Mustelus antarcticus*), and reaching over one-third space from its base to caudal (under one-third space from its base to caudal in *M. antarcticus*).

MUSTELUS ANTARCTICUS Günther

Mustelus antarcticus GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 387, 1870 (type locality: New South Wales, Tasmania, New Zealand, Antarctic Expedition).—CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 216, 1872 (Hobsons Bay).—HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 76, pl. 12, fig. 123, 1872.—CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 88, 1873 (Melbourne).—HECTOR, Handb. New Zealand, p. 16, 1879.—RAMSAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 356, 1882 (Tasmania, Port Phillip, Port Jackson).—PARKER, Trans. New Zealand Inst., vol. 15, p. 219, pl. 30, 1882.—MCCOY, Prodromus Zool. Victoria, dec. 9, pl. 87, 1884.—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 4, 1888 (Port Jackson, Broken Bay; Launceston, Tasmania) ; Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1770, 1888 (New South Wales).—PARKER, Trans. New Zealand Inst., vol. 22, p. 331, pl. 19, 1889.—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 43, 1890 (passim).—WAITE, Prelim. Rep. *Thetis* Exped., p. 38, 1898 (east to Newcastle Bight, New South Wales) ; Rec. Canterbury Mus., vol. 1, No. 1, p. 7, 1907 (reference) ; No. 2, p. 10, pl. 14, fig. 2, 1909 (New Zealand coast in 10 to 105 fathoms).—MCCULLOCH, Rec. Australian Mus., vol. 7, p. 315, pl. 90, fig. 3, 1909 (Manly).—OGILBY, Commerc. Fish. Fisher. Queensland, p. 46, 1915 (Moreton Bay) ; Mem. Queensland Mus., vol. 5, p. 78, 1916 (Southport, Moreton Bay, Brisbane River, Great Sandy Strait).—WAITE, Rec. South Australian Mus., vol. 2, Apr. 23, p. 14, fig. 13, 1921.—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 128, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 6, pl. 1, fig. 13a, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 489, 1930 (reference).—WHITLEY, Mem. Queensland Mus. vol. 10, pt. 4, p. 199, 1934 (reference).

Galeus antarcticus Waite, Mem. Australian Mus., vol. 4, p. 33, 1899 (New South Wales); Rec. Australian Mus., vol. 4, p. 175, fig. 19, 1902 (fetus and shell gland).

Galeorhinus antarcticus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 175, 1913 (Melbourne).—Waite and McCulloch, Trans. Roy. Soc. South Australia, vol. 39, p. 459, 1915 (Great Australian Bight in 86–94 fathoms).

Mustelus vulgaris (not Müller and Henle) Gray, List fish British Museum, p. 56 1851 (Antarctic Expedition).

Mustelus laevis (not Risso) Kner, Reise *Novara*, Fische, p. 415, 1865 (Auckland).

Depth 7 to 7⅖ to subcaudal origin; head 4½ to 4⅗, width 1⅔ to 1⅘. Snout 2¼ to 2½ in head, rather obtusely rounded as seen from above; eye 4⅔ to 5¾, twice long as deep, 2 to 2⅓ in snout, 2¼ to 2⅓ in interorbital; dentary width 3 to 3¾ in head, length 1½ to 1⅘ its width, with deep labial grooves, upper longer or not quite half jaw length; teeth in 60 rows in jaws, smooth, broader than long; nostrils much nearer mouth than snout end, width 1½ in internarial, front valve triangular; interorbital 2⅗ to 2⅔ in head, broad, convex. Gill openings with last 2 or 3 closer together, second and third largest, fourth and fifth above pectoral base. Spiracle small, level with eye and about ¼ eye diameter posterior.

Scales very small, end in single point, tricarinate.

First dorsal origin opposite inner angle of depressed pectoral, front edge 1⅖ to 1⅘ in head; second dorsal origin nearer that of ventral than subcaudal lobe origin, front edge 1¾ to 2 in head; anal inserted opposite first ⅓ or ⅖ of second dorsal base, front edge 2⅛ to 2⅞ in head; subcaudal length 1¼ to 1⅓, front edge 1⅘ to 2⅛ in its length; least depth of caudal peduncle 6½ to 7 in head; pectoral length 1¼ to 1⅓, width 1⅓ to 1⅖ its length; ventral length 1⅗ to 1¾ in head; claspers narrow, slender, pointed, extend little beyond ventrals.

Gray or gray-brown above, under surfaces whitish.

South Australia, Victoria, New South Wales, Tasmania, New Zealand.

U.S.N.M. No. 39675. New Zealand. Otago University. Length, 405 mm.
U.S.N.M. No. 40023. Port Jackson. Australian Museum. Length, 440 mm.

MUSTELUS CANIS (Mitchill)

Squalus canis Mitchill, Trans. Literary Philos. Soc. New York, vol. 1, p. 486, 1815 (type locality: New York).

Mustelus canis Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 30, 1925 (Natal).—Norman, *Discovery* Rep., vol. 12, p. 36, 1935 (lat. 33°53′ S., long. 17°39′ E., in 310 m.).—Fowler, Bull. Amer. Mus. Nat. Hist.; vol. 70, pt. 1, p. 61, fig. 16, 1936 (New Jersey).

Mustelus vulgaris Cloquet, Dict. Sci. Nat., vol. 14, p. 406, 1819 (on *Galeus laevis* Rondelet, Pisc., p. 375, 1554, type locality: Europe).

Mustelus laevis RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, 1826, p. 127 (type locality: Nice).—CLARK, Rep. Sci. Res. *Scotia*, Scot. Nat. Antarct. Exped., vol. 4, p. 395, 1915 (Cape Colony).

Galeorhinus laevis GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 176, pl. 4, figs. 4-9, pl. 60, figs. 1-4, 1913 (France; New York).

Mustelus equestris BONAPARTE, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 7, descr., pl. fig. 2, 1834 (type locality: Italy).

Depth 7½ to 8 to subcaudal origin; head 5 to 6, width 1¼ to 1¾. Snout 2 to 2⅖ in head; eye 4⅓ to 6⅕, 2½ to 2⅗ in snout, 5 to 5½ in interorbital; mouth width 2⅓ to 3½ in head, length 2⅔ to 3 in width, end of mandible slightly before front eye edge; outside mouth angle rather long fold forms flap projecting posteriorly, though groove distinct posteriorly around it short along upper jaw; teeth in 55 rows, blunt, tubercular; nostrils midway in preoral, internarial half preoral length; interorbital 2½ to 2¾ in head, slightly convex. Third gill opening deepest, last 2 over pectoral.

Scales minute.

First dorsal origin well behind pectoral base, over hind inner pectoral angle, front fin edge 1⅙ to 1⅔ in head; front edge of second dorsal 1⅔ to 1⅘; anal origin opposite middle of second dorsal base, front fin edge 2 to 2¼ in head; least depth of caudal peduncle 5½ to 6⅖; caudal 3½ to 3⅘ in rest of body; front subcaudal edge 2 to 2⅕ in head; pectoral 1 to 1⅗, width 1⅔ to 2 in its length; ventral 1½ to 1⅗ in head.

Dull gray-brown above, or pale gray to olive. Under surface of body whitish. Upper fins gray, paired fins paler below. Young often with blackish on dorsals and caudal terminally and hind fin edges pale.

Atlantic, South Africa.

A.N.S.P. Nos. 617-620. Italy. C. L. Bonaparte. Length, 225 to 664 mm. Types of *Mustelus equestris*.

Subgenus MUSTELUS Linck

MUSTELUS MANAZO Bleeker

Mustelus manazo BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 26, pp. 42, 126, 1857 (type locality: Nagasaki).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 403, 1865 (copied).—GÜNTHER, Cat. Fishes British Museum, vol. 8, p. 387, 1870 (Japan; Ceylon?); Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 154, 1874 (Chefoo).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 119, 1874 (Amoy).—DAY, Fishes of India, pt. 4, p. 720, pl. 186, fig. 3, 1878 (Kurrachee).—PETERS, Monatsb. Akad. Wiss. Berlin, 1880, p. 926 (Ningpo).—DAY, Fishes of India, Suppl., p. 24, 1888 (Kurrachee); Fauna British India, vol 1, p. 24, 1889 (fig. copied) (India; Japan).—BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—STEINDACHNER, Ann. Hofmus. Wien, vol. 11, p. 224, 1896 (Kobe, Hiogo, Nagasaki).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 62, 1897.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 336, 1900 (Tokyo); Annot. Zool. Japan., vol. 3, pts.

2–3, p. 39 (128), 1901 (Yokohama; Hakodate).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 608, 1903 (Hakodate, Aomori, Matsushima, Tokyo, Misaki, Kobe, Onomichi, Hiroshima, Hakata).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 192, 1904 (locality?).—SCHMIDT, Fishes western seas Russia, p. 289, 1904 (Gensan).—SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 460, 1906 (Kochi, Japan).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 400, 1912 (Otaru, Hakodate, Tokyo, Kagoshima).—ZUGMAYER, Abh. Bayer, Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran and Oman).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 30, pl. 1, fig. 4, 1925 (Natal).—TIRANT, Service Océanogr. pêches Indochine, 6ᵉ note, p. 63, 1929 (Cochinchina).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 8, fig. 6, 1929 (Amoy).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 589, 1930 (Tokyo; Nagasaki); Hong Kong Nat., vol. 1, p. 80, fig. 8, 1930 (China); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 489 1930 (Japan).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 408, 1934 (Natal); List Fish. Malaya, p. 10, 1938 (reference).

Mustelus mustelus manazo BERG, Faune Russie, Poiss., vol. 1, p. 68, 1911 (Gensan and Hakodate).—SOLDATOV and LINDBERG, Bull. Pac. Sci. Fisher. Inst., vol. 5, p. 7, 1930 (Far East Seas).

Galeorhinus manazo GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 171, 1913 Tokyo).—SCHMIDT and LINDBERG, Bull. Acad. Sci. U. S. S. R., 1930, p. 136 (Tsuruga).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 5 1931 (Nagasaki).—CHEVEY, Inst. Océanogr. Indochine, 19ᵉ note, p. 6, 1932 (Indo China).—TANAKA, Jap. Fish. Life Colours, No. 9, 1933.

Cynias manazo IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata., p. 190, 1920 (Tokyo).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 100, 1925 (Sapporo; Yokohama; Osaka; Chosi; Misaki).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Jensen and Mokpo, Korea).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 233, fig. 8, 1932 (Tsingtau).—WANG, Biol. Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 91, 1933 (Ningpo; Chusan; Haimen; Wenchow; Yengting).

Mustelus vulgaris (not Müller and Henle) SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 303, pl. 134, 1850 (Bay of Nagasaki).

Mustelus griseus PIETSCHMANN, Anz. Akad. Wiss. Wien, vol. 45, p. 132, 1908 (Japan); Sitzber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 694, pl. 2, figs. 1, 3 a-b, 1908 (type).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, No. 2, p. 101, 1925 (Mikawa Bay, Toyama, Tokyo market).

Cynais griseus MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Genzan and Mokpo, Korea).

Mustelus mustelus (not Linnaeus) PIETSCHMANN, Sitz. Berg. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 690, 1908 (Japan, Fusan, Tokyo, Nagasaki; not Trieste).

Cynias mustelus TANAKA, Fishes of Japan, vol. 3, p. 47, pl. 12, figs. 37-41, 1911.

Depth 6⅘ to 9¼ to subcaudal origin; head 4½ to 4⅞, width 1½ to 1⅘. Snout 2¼ to 2⅓ in head, triangular as seen in profile from above; eye 4⅘ to 5⅛, 2 to 2⅛ in snout, 2 in interorbital, twice long as deep; dentary width 3⅓ to 3½ in head, length ⅔ its width, with deep labial grooves, upper longer or not quite half jaw length; teeth in 48 rows above, 40 below, small, convex on crown; nostrils much nearer mouth than snout end, width $1\frac{1}{4}$ in internarial, front valve triangular; interorbital $2\frac{1}{2}$ to $2\frac{3}{5}$ in head, broad, convex. Gill openings equidistant, first largest and others graduated to last which smallest, last 2 above pectoral base. Spiracle moderate, level with eye and $\frac{1}{3}$ eye diameter posterior.

Scales very small, each ends in single point, triangular, tricarinate.

First dorsal origin opposite inner angle of depressed pectoral, front edge $1\frac{1}{2}$ to $1\frac{3}{5}$ in head; second dorsal origin nearer ventral origin than subcaudal origin, front edge $1\frac{4}{5}$ to $1\frac{9}{10}$ in head; anal origin opposite last third in second dorsal base, front edge $2\frac{7}{8}$ to $3\frac{1}{2}$ in head; subcaudal length $1\frac{1}{6}$ to $1\frac{1}{4}$, front edge $1\frac{4}{5}$ to $2\frac{1}{10}$ its length; least depth of caudal peduncle 6 to $6\frac{1}{2}$ in head; pectoral length $1\frac{1}{5}$ to $1\frac{1}{2}$, width $1\frac{1}{3}$ to $1\frac{2}{5}$ its length; ventral length $1\frac{3}{5}$ to 2 in head; claspers narrow, slender, extend little beyond ventrals.

Gray-brown above, whitish below. Scattered whitish spots over upper surface of body.

Arabian Sea, Natal, Indo-China, China, Korea, Japan.

U.S.N.M. No. 22610. Muiramisaki, Japan. Japanese Government.
U.S.N.M. No. 49410. Yokohama. *Albatross* collection.
U.S.N.M. No. 49411. Yokohama. *Albatross* collection.
U.S.N.M. No. 50727. Yokohama. Jordan and Snyder. Length, 530 mm.
U.S.N.M. No. 50729. Nagasaki. Jordan and Snyder. Length, 335 mm.
U.S.N.M. No. 59782. Kochi. Dr. H. M Smith. Length, 315 mm.
U.S.N.M. No. 71774. Otaru. *Albatross* collection 1906.
U.S.N.M. No. 71775–71777. Kagoshima. *Albatross* collection 1906.
U.S.N.M. No. 85861. Northeast China. A. de C. Sowerby.

MUSTELUS MUSTELUS (Linnaeus)

Squalus mustelus Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 235, 1758 (type locality: Europe); ed. 12, vol. 1, p. 400, 1766.—Gmelin, Syst. Nat. Linn., vol. 1, p. 1492, 1789 (Oceano europaeo et pacifico).—Walbaum, Artedi Pisc., vol. 3, p. 505, 1792 (copied).—Lacépède, Hist. Nat. Poiss., vol. 1, p. 244, 1798 (Europe, Pacific seas).—Schneider, Syst. Ichth. Bloch, p. 128, 1801 (European Ocean, Pacific).

Mustelus mustelus Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 191 (Cape waters); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 61, 1936 (copied).

Mustelus asterias Cloquet, Dict. Sci. Nat., vol. 14, p. 406, 1819 (on *Galeus asterias* Rondelet, Pisc., p. 376, 1554, type locality: Europe).—Brusina, Glasnik Naravosl. Družtva, vol. 3, p. 226, 1888 (Red Sea).

Squalus hinnulus Blainville, Faune Française, Poissons, p. 83, pl. 20, fig. 2, 1825 (type locality: Mediterranean).

Mustelus hinnulus Brusina, Glasnik Naravosl. Družtva, vol. 3, p. 228, 1888 (Red Sea).

Mustelus stellatus Risso, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 126, 1826 (type locality: Nice).—Bleeker, Nat. Tijdschr. Nederland. Indie, vol. 21, p. 57, 1860 (Cape of Good Hope).

Mustelus plebejus Bonaparte, Icon. Fauna Italica, Pesci, vol. 3, pt. 2, fasc. VIII, descr., pl., fig. 1, 1834 (type locality: Italy).

Squalus albomaculatus PLUCAR, Fisch Platz zu Triest., p. 7, 1846 (type locality: Trieste).

Mustelus vulgaris (not Cloquet) BLEEKER, Nat. Tijdschr. Nederland. Indie, vol. 21, p. 57, 1860 (Cape of Good Hope).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 668, 1871 (Massaua).

Squalus edentulus (Chiereghini) DÖDERLEIN, Manual ittiologico del Mediterraneo, pt. 2, p. 30, 1881 (type locality: Venice). (Reference in synonymy).

Depth 6½ to 7 to subcaudal origin; head 4¾ to 5, width 1⅓ to 1½. Snout 2⅕ to 2⅓ in head; eye 4 to 6, 2 to 2¼ in snout, 2⅕ in interorbital; mouth width 1¾ to 2 in head, length ⅓ its width, labial folds nearly half jaw length, upper little longer; teeth smooth, small, crowns convex; nostrils midway in preoral or little nearer mouth, front valve with rather extended rounded lobe, internarial 2 to 2¼ in preoral length; interorbital 2 in head, low. Last gill opening over pectoral base.

Scales very minute.

First dorsal origin close behind pectoral base or well before inner hind pectoral angle, front fin edge 1 to 1⅛ in head; front second dorsal edge 1½ to 1⅘; front anal edge 2¼ to 3, origin opposite middle of second dorsal base; least depth of caudal peduncle 4¾ to 5 in head; pectoral 1 to 1⅛, width 1¼ to 1⅔ its length; ventral length 1½ to 1⅔; caudal 3⅖ to 3⅔ in rest of body, front subcaudal edge 2⅛ to 2⅗ in head.

Gray above, paler to whitish below. Along upper half of body or above lateral line numerous and variable white spots. Fins all more or less with whitish borders.

Eastern Atlantic, South Africa, Red Sea. Although Barnard places *Mustelus vulgaris*, as figured by Müller and Henle, with *Mustelus canis*, its advanced first dorsal and blunt teeth show it is surely closer to the present species.

4 young, A.N.S.P. Cape waters. H. W. Bell Marley. Length, 140 to 150 mm.

MUSTELUS PUNCTULATUS Risso

Mustelus punctulatus RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 128, 1926 (type locality: Nice).—MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 190, 1841.

Galeorhinus punctulatus GARMAN, Mem. Mus., Comp. Zool., vol. 36, p. 173, 1913 (Nice).

Mustelus megalopterus ANDREW SMITH, Ill. zool. South Africa, Fishes, pl. 2, 1849 (type locality: Capetown).—GRAY, List fish British Museum, p. 58, 1851 (reference).

Mustelus vulgaris (not Cloquet) GRAY, List fish British Museum, p. 56, 1851 (Cape Seas).—GILCHRIST, Marine Biol. Surv. South Africa, Spec. Rep. No. 2, pt. 3, p. 47, 1922 (off Natal, in 150 fathoms).

Mustelus laevis GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 385 (Cape of Good Hope), p. 386, 1870 (footnote of *Mustelus natalensis*).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 668, 1871 (Red Sea).—HILGENDORF, Symbol.

Physic. Hemprich-Ehrenberg, pl. 7, figs. 3, a–e, 1899 (Red Sea).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 29, 1925 (Table Bay, Kalk Bay to Natal, to 100 fathoms).

Galeorhinus laevis GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 176, 1913, not figures (part).

Mustelus mosis (Ehrenberg) KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 668, 1871 (name in synonymy).

? *Mustelus maculatus* (not Kner and Steindachner) CLARK, Rep. Sci. Res. *Scotia*, Scot. Nat. Antarctic Exped., vol. 4, p. 395, 1915 (entrance to Saldanha Bay).

Mustelus nigromaculatus EVERMANN and RADCLIFFE, U. S. Nat. Mus. Bull. 95, p. 9, pl. 2, fig. 2, 1917 (type locality: Lobo de Tierra, Peru).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 489, 1930 (reference).

Body elongate, slender; head narrow, depressed. Snout long, tapering, blunted at end; eye small, pupil horizontal, orbit 2⅔ in snout; mouth small, width ⅔ snout length, length half its own width, short labial folds less half jaw length, upper little longer; teeth smooth, cusps rather produced and angular, with concave indentation on outer edge, though not denticulate; nostrils at last third of preoral length, front valve produced in rounded lobe. Gill openings narrow, greatest width ⅔ orbit length.

Fins all concave on hind edge and rounded on outer angle; first dorsal origin above inner pectoral angle, height ¾ base length which half space to second dorsal, end reaching opposite ventrals; second dorsal base nearly equals first, fin about half as large, middle of base above anal origin; anal extends ½ orbit length farther back than second dorsal, base length ⅔ of space to subcaudal; caudal nearly 5 in total, subcaudal weak; pectoral rather small, not reaching middle of dorsal base, width 1½ in length.

Gray with scattered small black spots. Lower surfaces white. Fins darker, subcaudal blackish toward lower edges. Length 628 mm. (Garman.)

Atlantic, South Africa, Red Sea. *Mustelus nigromaculatus* Evermann and Radcliffe, founded on an example 500 mm. long from the Peruvian coast, does not appear to differ.

Genus SCYLLIOGALEUS Boulenger

Scylliogaleus BOULENGER, Ann. Mag. Nat. Hist., ser. 7, vol. 10, p. 51, 1902. (Type, *Scylliogaleus quecketti* Boulenger, monotypic.)

Body slender, compressed, shorter than tail. Head wide, depressed. Snout broad, widely rounded. Eye with nictitating membrane, pupil an oblique slit. Mouth regularly arched, with strong labial folds. Teeth small, in pavement, with flattened crowns, in bands in both jaws. Nostrils far apart, connected with mouth by a groove, front valves broad and reaching to teeth, narrowly separated from one another medially. Spiracle distinct, behind eye. Scales keeled. First dorsal above space between pectorals and ventrals, second fin above anal, not much smaller. Anal much smaller than second dorsal. Caudal slender, not deep, without pits or lateral folds.

SCYLLIOGALEUS QUECKETTI Boulenger

Scylliogaleus quecketti Boulenger, Ann. Mag. Nat. Hist., ser. 7, vol. 10, p. 51, pl. 4, 1902 (type locality: off Natal in 40 fathoms).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 179, 1913 (Natal).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, p. 283, 1916 (reference).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 31, pl. 1, fig. 5, 1925 (copied).

Scylliogaleus queketti Barnard, Ann. South African Mus., vol. 21, pt. 2, p. 1013, 1927 (note).

Depth 6½ to subcaudal origin; head 5¼, width about 1¼. Snout 2⅗ in head; eye 4, 1¾ in snout; mouth width about 2¾ in head, length about 2⅓ its width, which much greater than preoral length; long labial folds nearly half length of each jaw; teeth numerous, 38 rows below, with feebly ribbed crowns; nostrils nearer mouth than snout end, wide front valves reach mouth, internarial equals preoral; interorbital low. First gill opening equals eye, last 2 shortest and little closer above pectoral.

Scales keeled, acutely pointed.

First dorsal origin little nearer pectoral than ventral origin, front edge equals head; front edge of second dorsal 1⅛; and origin opposite first fourth of anal base; anal smaller, front edge 1⅞ in head; least depth of caudal peduncle 3⅞; pectoral 1⅒, reaches little beyond first dorsal origin; ventral length 1½; caudal 3⅕ in rest of body.

Uniform gray above, white beneath. Fins gray, caudal edged with white. Length 340 mm. (Boulenger.)

Natal, South Africa.

Family SPHYRNIDAE

Head with remarkable lateral expansions of skull across frontal region, thus eyes moved outward. Eyes with well-developed nictitating membranes. Mouth crescentic, inferior. Teeth alike in two jaws, compressed, oblique, each notched on outside near base and labial folds rudimentary. Nostrils distinct from one another and from mouth. Last gill opening over pectoral base. No spiracles. First dorsal large, in advance of ventrals though nearer pectorals. Second dorsal and anal small. Caudal root with pit, single notch toward fin tip. Pectorals large.

A very distinct group of sharks, greatly suggestive of typical Galeorhinidae in many ways, such as *Scoliodon*, *Eulamia*, etc., differing in the greatly expanded lateral lobes on each side of the head.

These expansions vary greatly from those species with only a slight prominence to the extremes in which each lobe greatly exceeds the length of the head. It is only with maturity such modifications are found, for in the young they are less developed. All are voracious feeders, usually living in deep water and some species reaching fifteen feet in length. A large female has been known to contain upward of forty embryos. Fossils are known from the early Tertiary.

Genus SPHYRNA Rafinesque

Sphyrna RAFINESQUE, Indice itt. siciliana, pp. 46, 60, 1810. (Type, *Squalus zygaena* Linnaeus, designated by Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 26, 1883.)

Cestracion (Klein) WALBAUM, Artedi Pisc., vol. 3, p. 580, 1792. (Type, *Squalus zygaena* Linnaeus, designated by Gill, Ann. Lyceum Nat. Hist. New York, vol. 8, p. 37, 1861, inadmissible.)

Sphyrnias RAFINESQUE, Analyse de la nature, p. 93, 1815. (Type, *Squalus zygaena* Linnaeus, virtually, as *Sphyrnias* Rafinesque proposed to replace *Sphyrna* Rafinesque 1810.)

Cestrorhinus BLAINVILLE, Bull. Soc. Philomath. Paris, vol. 8, p. 121, 1816. (Type, *Squalus zygaena* Linnaeus, designated by Fowler, Geol. Surv. New Jersey, Bull. 4, p. 77, 1911.)

Zygaena (not Fabricius 1775 in Lepidoptera) CUVIER, Règne Animal vol. 2, p. 27, 1817. (Type, *Squalus zygaena* Linnaeus, tautotypic.)

Zygoena RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 125, 1826. Type, *Squalus zygaena* Linnaeus.)

Zygana SWAINSON, Nat. Hist. Animals, vol. 2, p. 318, 1839. (Type, *Zygaena laticeps* Cantor, monotypic.)

Sphyrichthys THIENEMANN, Lehrb. Zool., p. 408, 1828. (Type, *Squalus zygaena* Linnaeus, virtually, as *Sphyrichthys* Thienemann proposed to replace *Sphyrna* Rafinesque.)

Platysqualus SWAINSON, Nat. Hist. Animals, vol. 2, p. 318, 1838. (Type, *Squalus tiburo* Linnaeus, monotypic.)

Sphyra HOEVEN, Handb. Dierk., vol. 2, p. 68, 1858. (Type, *Squalus zygaena* Linnaeus, virtually, as *Sphyra* Hoeven emendation for *Sphyrna* Rafinesque.)

Eusphyra GILL, Ann. Lyceum Nat. Hist. New York, vol. 7, pp. 403, 412, 1862. (Type, *Zygaena blochii* Cuvier, monotypic.)

Reniceps GILL, Ann. Lyceum Nat. Hist. New York, vol. 7, pp. 403, 412, 1862. (Type, *Squalus tiburo* Linnaeus, orthotypic.)

Body behind head compressed. Head much depressed, with wide oculonarial expansion at each side. Eyes remote from middle of head, with nictitating membranes. Mouth inferior, greatly arched forward, labial fold rudimentary. Teeth compressed, triangular, bases broad, with cusps more or less obliquely directed toward mouth angles and notched on outer edges. Nostrils at front edge of head. No spiracles. First dorsal above space between pectorals and ventrals. Second dorsal above anal. Caudal with pits at origin, with produced subcaudal lobe.

ANALYSIS OF SPECIES

a^1. Platysqualus. Head heart- or kidney-shaped, oculonarial expansion narrow; eyes and nostrils not widely separated ---------- tiburo

a^2. Head hammer-shaped, very broad.

  b^1. Sphyrna. Eyes and nostrils close together.

    c^1. Oculonarial expansion at right angles to body.

      d^1. Narial groove in front of snout; outer edge of hammer rounded and front of snout broadly rounded ---------- tudes

      d^2. No narial groove; outer edge of hammer and front of snout nearly straight ---------- mokarran

    c^2. Oculonarial expansion medium, oblique.

      e^1. Concavity in front profile, as seen from above, very slight over nostril; cusps of teeth low, very oblique ---------- lewini

      e^2. Concavity in front profile, as seen from above, deep over nostril; cusps of teeth prominent ---------- zygaena

  b^2. Eusphyra. Eyes and nostrils widely separated; oculonarial expansion wide, slender ---------- blochii.

Subgenus PLATYSQUALUS Swainson

SPHYRNA TIBURO (Linnaeus)

Squalus tiburo Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 234, 1758 (type locality: In America); ed. 12, vol. 1, p. 399, 1766.—Walbaum, Artedi Pisc., vol. 3, p. 516, 1792 (copied).—Cuvier, Règne animal, vol. 2, p. 127, 1817 (on "Marcgr. 181").

Zygaena tiburo Valenciennes, Mém. Mus. Hist. Nat. Paris, vol. 9, p. 226, pl. 12, figs. 2a–b, 1822 (Brazil).—Cuvier, Règne animal, vol. 2, ed. 2, p. 394, 1829 (reference).—Günther, Cat. Fishes British Museum, vol. 8, p. 382, 1870 (New Orleans, Belize, Atlantic, Bahia, China).—Elera, Cat. Fauna Filip., vol. 1, p. 615, 1895 (Luzon, Manila Bay, Navotas).

Sphyrnias tiburo Gray, List fish British Museum, p. 50, 1851 (China; American Seas).

Cestracion tiburo Garman, Mem. Mus. Comp. Zool., vol. 36, p. 160, pl. 1, figs. 4–5, 1913 (Massachusetts Bay).

Sphyrna tiburo Fowler, Hong Kong Naturalist, vol. 1, p. 86, 1930 (China).

Sphyrna tiburu Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (Atlantic Ocean). (Error.)

Depth 5¾ to subcaudal origin; head 3¾, length 1⅛ its width. Snout in profile 2⅓ in head; eye 7⅔, 3 in snout, 8⅔ in interorbital; mouth width 2½ in head, length 1⅕ its width, no labial grooves; teeth in 30 rows in jaws, entire, outer edge notched, without basal cusps; nostril large, internarial 1⅖ in head width, obsolete groove forward along front snout edge to first emargination; interorbital equals head length to third gill opening. Gill openings with second and third longest, last over pectoral.

Scales very minute.

First dorsal origin opposite inner hind pectoral angle, front fin edge 1¼ in head; second dorsal length $2\frac{1}{10}$; anal length $1\frac{9}{10}$, origin little before second dorsal origin; least depth of caudal peduncle

4¾ in head; pectoral 1⅗, width 1⅓ its length; ventral length 2¼ in head; caudal 2⅓ in rest of body, subcaudal 3¼ in caudal.

Pale brown on back, whitish or pale gray white below. Fins gray, dull brown medianly, also reflected on lower surfaces of paired fins, anal and subcaudal.

China, Philippines. Also in the Atlantic.

1 example. A.N.S.P. Newport, Rhode Island. Samuel Powell. Length, 311 mm.

Subgenus Sphyrna Rafinesque

SPHYRNA TUDES (Valenciennes)

Zygaena tudes Cuvier, Règne Animal, vol. 2, p. 393, 1817 (reference).—Valenciennes, Mém. Mus. Hist. Nat. Paris, vol. 9, p. 225, pl. 12, figs. 1a–b, 1822 (type locality: Mediterranean; Cayenne; Coromandel).—Cuvier, Règne Animal, Poiss., ed. ill., pl. 117, fig. 1, 1839.—Lay and Bennett, Zool. Beechey's Voy., Fishes, p. 47, 1939 (Oahu).—Jouan, Mém. Soc. Imp. Sci. Nat. Cherbourg, vol. 8, p. 245, 1861 (Kanala, New Caledonia).—Günther, Cat. Fishes British Mus., vol. 8, p. 382, 1870 (West Indies, Demerara, Zanzibar, Sumatra).—Day, Fishes of India, pt. 4, p. 720, pl. 188, fig. 4, 1878 (Mediterranean, Indian Ocean, Indian Archipelago, Atlantic).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 4, 1888 (Madras).—Day, Fauna British India, Fishes, vol. 1, p. 23, 1889 (Indian Ocean, East Indies).—Bartlett, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Bumtal).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 626, 1926 (Sarawak).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^e note, p. 60, 1929 (Purochai).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 351, 1929 (Travancore).

Zygoena tudes Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference)

Sphyrna tudes Müller and Henle, Syst. Beschr. Plagiostomen, p. 53, 1841 (Cayenne and Coromandel).—Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 66 (Surinam).—Pellegrin, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 2, 1912 (Honolulu).—Weber, *Siboga* Exped., Fische, vol. 57, p. 592, 1913 (Makassar and Timor).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1919, p. 129 (Surinam example); Mem. Bishop Mus., vol. 10, p. 23, 1928 (compiled); proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (Atlantic and Indian Oceans).—H5S85, Copeia, No. 4, p. 144, 1930 (Manila Bay, Cebu, Zamboanga).—Suvatti, Index Fish. Siam, p. 3, 1934 (Samut Prakan, Gulf of Siam).—Fowler, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 64, 1936 (Surinam).—Roxas and Martin, Dept. Agric. Comm. Manila, Tech. Bull. 6, p. 14, 1937 (reference).

Sphyrna (*Platysqualus*) *tudes* McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).

Sphyrnias tudes Gray, List fish British Museum, p. 50, 1851 (compiled).

Cestracion (*Zygaena*) *tudes* Duméril, Hist. Nat. Elasmobr., vol. 1, p. 384, 1865 (Nice, Algeria, Cayenne).

Cestracion tudes Garman, Mem. Mus. Comp. Zool., vol. 36, p. 159, 1913 (Rio Janeiro, Panama).—Chevey, Inst. Océanogr. Indochine, 19^e note, p. 6, 1932 (Indochina).

Sphyrna tiburo (not Linnaeus) Rafinesque, Indice d'ittiologia siciliana, p. 47, 1810.

Sphyrna chiereghini Nardo, Synon. Moderna Pesc. Chiereghini, p. 111, 1847 (type locality: Venice, Italy).

Depth 4⅘ to subcaudal origin; head 3⅖, width behind lateral expansions 2⅕ in head length. Snout 1⅕ in head, lateral expansion shorter than its width; eye 7 in head, 9¾ in interorbital; dentary width 3⅓ in head, length 1⅗ in its width, with short lower labial fold, also upper one rudimentary; teeth in about 30 rows above, 26 below; nostril 1⅓ eye diameters before eye, with long groove along front edge of hammer half way to middle of snout, which with distinct and rather prominent concavity before nostril as seen in front profile when viewed above; interorbital space equals head length to last gill opening. Gill openings rather large, last 2 above pectoral base and last shortest.

Scales tridentate, median point little largest and each with keel, extending parallel.

First dorsal begins before hind inner pectoral angle, front edge 1¼ in head, lobe falcate and hind lobe narrow short point; second dorsal inserted little behind anal origin, front edge 4¼ in head, with long, slender, pointed hind lobe greater than fin base; anal larger than second dorsal, front edge 3⅕ in head, ends behind in long slender point; caudal 1⅞ in rest of body, subcaudal 1⅔ its length; ventral length 2½ in head, pointed behind; short, flattened, pointed claspers less than hind edge.

Gray brown above, below whitish.

Arabian Sea, East Africa, India, East Indies, Indochina, Queensland, New South Wales, Melanesia, Hawaii. Also in the tropical Atlantic. Specimens from Mazatlan, Panama, and the west coast of South America in the United States National Museum.

U.S.N.M. No. 49330. Massaua, Red Sea. Museo Civico Milan. Length, 380 mm.

SPHYRNA MOKARRAN (Rüppell)

Zygaena mokarran Rüppell, Neue Wirbelth., Fische, p. 66, pl. 17, fig. 3, 1835 (type locality: Massauah, Red Sea).—Günther, Cat. Fishes British Mus., vol. 8, p. 383, 1870 (copied).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 667, 1871 (Red Sea).—Day, Ann. Mag. Nat. Hist., ser. 5, vol. 20, p. 389, 1887 (note).—Brusina, Glasnik Naravosl. Družtva, vol. 3, p. 225, 1888 (Red Sea).—Day, Fishes of India, Suppl., p. 809, 1888 (Red Sea to Kurrachee); Fauna British India, Fishes, vol. 1, p. 23, 1889.—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran).

Sphyrna mokarran Müller and Henle, Syst. Beschr. Plagiostomen, p. 54, 1841 (Red Sea).—Fowler, Hong Kong Nat., vol. 1, p. 86, fig. 12, 1930 (China).

Sphyrnias mokarran Gray, List fish British Mus., p. 51, 1851 (compiled).

Cestracion (*Zygaena*) *mokarran* Duméril, Hist. Nat. Elasmobr., vol. 1, p. 383, 1865 (compiled).

Cestracion mokarran Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 115, 1874 (Chinese drawing).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 160, 1913 (Red Sea; India).

Zygaena dissimilis Murray, Journ. Bombay Nat. Hist. Soc., vol. 2, p. 103, pl., 1887 (type locality: Kurrachee); Ann. Mag. Nat. Hist. ser. 5, vol. 20, p. 304, 1887.

Depth 7⅞ to subcaudal origin; head 4¼, 1⅓ in its width. Snout 11⅔ in head, front edge nearly straight or with few weak undulations; eye about 19; mouth width 2⅕, length about 4/7 width; teeth triangular, inclined, edges finely serrated, lower little narrower; nostrils rather close before eye, upper profile of head not notched above, broad internarial 1¼ in head width; interorbital equals head length to last gill opening. Last 2 gill openings above pectoral.

First dorsal origin behind pectoral base though before inner hind pectoral angle, front fin edge equals head to first gill opening; second dorsal length 1⅖; anal length 1⅞, origin slightly behind second dorsal origin; ventral length 2⅛ in head, clasper slender, not to anal; pectoral long as head to second gill opening; caudal 1⅘ in rest of body, subcaudal 3⅔ in caudal.

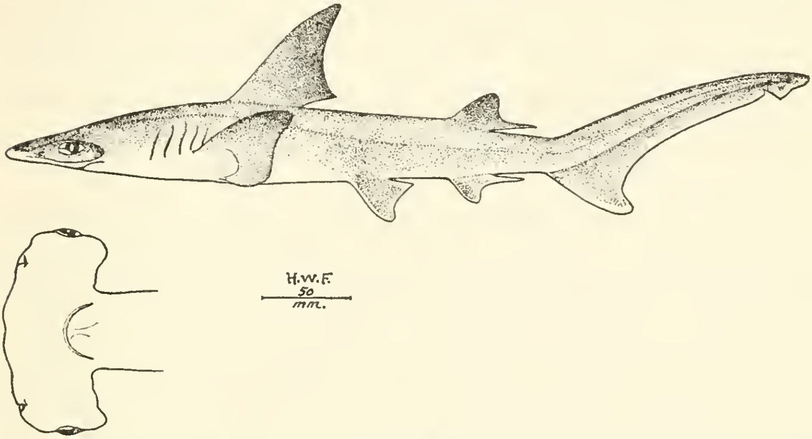

FIGURE 9.—*Sphyrna lewini* (Griffith): U.S.N.M. No. 40014, from Richmond River, New South Wales.

Soiled blue-gray, under surfaces flesh color. Iris grayish yellow. (Rüppell.)

Red Sea, India, China. According to Rüppell exceeds 3,050 mm.

SPHYRNA LEWINI (Griffith)

FIGURE 9

Zygaena lewini GRIFFITH, Animal Kingd. Cuvier, vol. 10, p. 640, pl. 1, 1834 (type locality: South coast of New Holland).

Zygaena leuwinii RAMSAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 96, 1880 (Port Jackson).

Cestracion leeuwenii DAY, Fishes of Malabar, p. 271, 1865 (compiled).

Cestracion (Zygaena) leeuwenii DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 383, 1865 ["Cotes de la terre de Leeuwen (Australie)"].

Cestracion lewini OGILBY, Mem. Queensland Mus., vol. 5, p. 81, 1916 (Moreton Bay).

Sphyrna lewini WAITE, Mem. Australian Mus., vol. 4, p. 34, 1890 (Shoalhaven Bight, New South Wales).—MCCULLOCH, Zool. Res. *Endearour*, vol. 1, p. 9, 1911 (Flinders Island, Bass Strait).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 192, pl. 28, figs. a-c (Moreton Bay), p. 199, 1934 (reference); Rec. Austral. Mus., vol. 20, no. 1, p. 4, 1937 (Batemans Bay).

Sphyrna (Sphyrna) lewini MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).

Zygaena malleus (not Risso) OGILBY, Cat. Fishes Austral. Mus., pt. 1, p. 3, 1888 (part).

Sphyrna zygaena (not Linnaeus) STUDER, Zool. Forsch. Gazelle, vol. 3, p. 263, 1889 (Moreton Bay).

Sphyrna tudes (not Valenciennes) OGILBY, Ann. Queensland Mus., No. 9, p. 4, 1908 (Moreton Bay; Tweed Heads).—BORODIN, Bull. Vanderbilt Marine Mus., vol. 1, p. 69, 1932 (Southport, Queensland).

Cestracion tudes OGILBY, Mem. Queensland Mus., vol. 5, pp. 82, 94, 1916 (Tweed Heads; Moreton Bay; Cabbagetree Creek; Brisbane River; South Hill; Double Point Island).

Cestracion oceanica GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 158, 1913 (type locality: Society Islands).

Sphyrna oceanica FOWLER, Mem. Bishop Mus., vol. 10, p. 23, 1928 (copied); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (reference).

Depth 6⅔ to subcaudal origin; head 3⅞, width behind lateral expansions 2 in head length. Snout 1⅗ in head, lateral expansion shorter than its width; eye 6 in head, 7⅓ in interorbital; dentary width 2¾ in head, length 2 in its width, without labial folds; teeth immature, very small; nostril eye diameter before eye, without any groove along front edge of hammer, which with only very slight concavity before nostril as seen in front profile when viewed above; interorbital space equals head length to last gill opening. Gill openings rather large, last 2 above pectoral base and last shortest.

Scales quindentate, points subequal, each with keel so that keels parallel.

First dorsal begins before hind inner pectoral angle, front edge 1 in head, falcate lobe and hind lobe short triangular point; second dorsal inserted slightly behind anal origin, front edge 3 in head, ends behind in long slender pointed lobe; anal little larger than second dorsal, front edge 3$\frac{1}{10}$ in head, ends in slender pointed lobe, behind shorter than that of second dorsal; caudal 2 in rest of body, subcaudal lobe 2⅘ in caudal fin; pectoral 1⅖ in head, width 1½ its length; ventral length 2½ in head, claspers broad, flattened, pointed and shorter than hind ventral lobe.

Brown above, whitish beneath. Fins all with more or less grayish.

Society Islands, New South Wales. This species is very close to *Sphyrna zygaena*, from which it is distinguished chiefly by the very shallow concavities in the front profile line as the fish is viewed from above. Moreover there is no groove along the front edge of the hammer from each nostril as in *Sphyrna zygaena*.

U.S.N.M. no. 40014. Richmond River, New South Wales. Australian Museum. Length, 450 mm.

SPHYRNA ZYGAENA (Linnaeus)

Squalus zygaena LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 234, 1758 (type locality: Europe; America); ed. 12, vol. 1, p. 399, 1766.—FORSKÅL, Descript. Animal., p. 10 (Arabia), p. 18, 1775 (Malta).—BLOCH, Naturg. ausläud. Fische, vol. 1, p. 29, pl. 117, 1785 (Smirna).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1494, 1789 (Atlantic, Mediterranean, American and Indian Seas).—WALBAUM, Artedi Pisc., vol. 3, p. 508, 1792 (copied).—FORSTER, Fauna Indica, p. 13, 1795.—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 257, 1798 (all the seas).—BLUMENBACH, Handb. Naturg., p. 257, 1799.—SCHNEIDER, Syst. Ichth. Bloch, p. 131, 1801 (Indian, American, and Mediterranean Seas).—SHAW, General zoology, vol. 5, p. 354, pl. 154, 1804.—CUVIER, Règne animal, vol. 2, p. 127, 1817 (our seas).

Squalus zygena BONNATERRE, Tabl. Encyclop. Ichth., p. 9, pl. 6, fig. 15, 1788 (Atlantic and Mediterranean).

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Cestracion zygoena Chevey, Inst. Oceanogr. Indo Chine, 19ᵉ note, p. 6, 1932 (Cochinchina).

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? *Cestrorhinus caroliniensis* BLAINVILLE, Bull. Soc. Philomath., Paris, vol. 8, p. 121, 1816 (name only).

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Zygaena indica VAN HASSELT, Algemein Konst. Letterbode, May 1823, p. — (type locality: Java) ; Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824 (Java).

Zygaena subarcuata STORER, Proc. Boston Soc. Nat. Hist., vol. 3, p. 70, 1848 (type locality: Cape Cod, Mass.).

Zygaena erythraea (Ehrenberg) KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 666, 1871 (name in synonymy).—HILGENDORF, Symbol. Physic. Hemprich-Ehrenberg, p. 8, pl. 6, fig. 2, 1899 (type locality: Red Sea).

Depth 4⅔ to 7⅘ to subcaudal origin; head 3⅞ to 4⅞, length 1¼ to 1⅔ in width, as seen from above front edge moderately convex with rather deep concave notch above nostril. Front median end of snout, measured across from snout end to eye, 1⅕ to 1⅗ in head; eye 8 to 8¾, orbit nearly twice eye in young to but slightly larger with age, 5¼ to 7 in snout, 12 to 13½ in interorbital; dentary width 2½ to 3, length half its width, grooves at mouth angles rudimentary or absent; teeth in young about 35 rows above and 32 rows below, alike in 2 jaws, compressed, outer edges deeply notched and inner edge straight, all minutely serrated in young and entire with age; prenasal groove along front snout edge about 1¼ to median snout end, outer nasal groove about long as orbit terminating anteriorly on hammer about diameter of orbit at front anteriorly; least width of expansion of hammer equals its projection from body, with hind edge oblique and slightly concave. Gill openings with second and third largest, fourth and fifth closer than others and above pectorals.

Scales minute, with 3 to 5 points and as many keels.

First dorsal origin close behind pectoral base, length 1 to 1⅕ in length, base length 2⅕ to 2¼ in interdorsal space, hind lobe, narrow, short, triangular; second dorsal opposite anal, length 2⅛ to 2¾ in head, base length 1¼ to 1⅓ in head; anal length 2 to 3¾ in head, ends in long narrowed point behind nearly long as that of soft dorsal; subcaudal 1½ to 1⅔, 2¼ to 2⅘ in caudal; least depth of caudal peduncle 3⅔ to 4 in head; pectoral 1⅓ to 1⅖, width 1⅗ to 1⅘ in its length; ventral length 1⅞ to 2⅖ in head.

Gray to gray-brown above, whitish below. Fins more or less blackish terminally.

Red Sea, Arabia, Zanzibar, Natal, Madagascar, Seychelles, India, Malay Peninsula, Pinang, Singapore, East Indies, Philippines, Indo-China, China, Formosa, Korea, Japan, Queensland, New South Wales, Victoria, South Australia, New Zealand, Polynesia, Hawaii. Also in the Eastern Pacific and tropical Atlantic. This species is somewhat variable, not only with individuals but with age. Waite separated the Australian form on account of the short nasal groove along the front of the head, noting "each groove is less than one-third the width of the head measured between the preocular prominences". To this he applied *Zygaena lewini* Griffith, whose figure does not seem to differ from the common hammer head. McCoy's figure of *Zygaena malleus* is similar, both showing the concavity above the nostril rather deep. Hilgendorf's reproduction of Ehrenberg's *Zygaena erythraea* shows the concavity above the nostril shallow, or more as in Garman's *Cestracion oceanica*, though as it seems somewhat faulty in some other respects I hesitate to place it with that species. It shows the groove from the nostril about ⅓ of space to middle of snout.

6120. Iloilo market. June 2, 1908. Length, 785 mm.
A422. Jolo market. March 6, 1908. Length, 498 mm.
6314. Manila market. June 25, 1908. Length, 550 mm.
6755. Manila market. April 20, 1908. Length, 420 mm.
U.S.N.M. No. 40014. Richmond River, New South Wales. Australian Museum.
U.S.N.M. No. 40026. Richmond River. Australian Museum. Length, 420 mm.
U.S.N.M. No. 51209. Hawaiian Islands. U. S. Bureau of Fisheries.
U.S.N.M. No. 51289. Wakanoura, Japan. D. S. Jordan and J. O. Snyder.
U.S.N.M. No. 51291. Nagasaki. D. S. Jordan and J. O. Snyder.
U.S.N.M. No. 52642. Hawaiian Islands. U. S. Bureau of Fisheries (03309). Length, 510 mm.
U.S.N.M. No. 52644. Hawaiian Islands. U. S. Bureau of Fisheries (2552). Length, 568 mm.
U.S.N.M. No. 56337. Philippines. G. A. Lung. Length, 460 mm.
U.S.N.M. No. 71779. Tokyo market. *Albatross* collection.
U.S.N.M. No. 72476. Batavia, Java. Bryant and Palmer. Length, 470 mm.
1 example. A.N.S.P. Padang, Sumatra. Harrison and Hiller. Length, 628 mm. When fresh in arrack, dark slaty brown above and over greater portion of body. Abdomen, head below, and bases of pectoral and ventral dull creamy buff or white. Pectoral tips below and tip of lower caudal lobe black. Peritoneum white.

Subgenus EUSPHYRA Gill

SPHYRNA BLOCHII (Cuvier)

Zygaena blochii CUVIER, Règne animal, vol. 2, p. 127, 1817 (on Bloch).—VALENCIENNES, Mém. Mus. Hist. Nat. Paris, vol. 9, p. 227, pl. 11, fig. 2a–b, 1822 (fetus) (no locality).—BENNETT, Life of Raffles, p. 694, 1830 (Sumatra).—CANTOR, Quarterly Medical Journ. Calcutta, p. 315, pls. 1–4, 1837; Trans. Med. Phys. Soc. Calcutta, vol. 8, pt. 2, p. ccxl, append., 1937.—BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 73, 1863 (Banka).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 380, 1870 (Calcutta, Singapore, India, Pinang, Malabar).—DAY, Fishes of India, pt. 4, p. 719, pl. 184, fig. 4, 1878 (India, Malay Archipelago, Malabar); Fauna British India, Fishes, vol. 1, 1889, p. 22 (fig. 4 copied) (India, Malay Archipelago).—BARTLETT, Sarawak Gaz., vol. 26, No. 366, p. 134, 1896 (Buntal and Moratabas).—JOHNSTONE, Fasc. Malayenses, Annandale and Robinson, Zool., pt. 2, p. 302, 1903 (Patani Bay).—DÜNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 192, 1904 (locality ?).—PEARSON, Ceylon Administr. Rep., 1915–18, p. F9.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e note, pp. 59, 175, 1929 (Cochinchina).

Zygaena blochi VOLTZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 237, 1907 (Benkulen).

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Sphyrna (*Eusphyra*) *blochii* MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).

Sphyrna blochi PELLEGRIN, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 2, 1912 (Singapore).—SUVATTI, Index Fish. Siam, p. 3, 1937 (Gulf of Siam; Thale Sap Songkhla; Chonburi).

Sphyrnias blochii GRAY, List fish British Museum, p. 50, 1851 (India; Singapore).—BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 35, 1860 (Calcutta).

Cestracion (*Zygaena*) *blochii* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 383, 1865 (Indian Ocean).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 60, p. 571, 1870 (Singapore).

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Squalus zygaena (not Linnaeus) Bloch, Naturg. ausländ. Fische, vol. 1, pl. 117, 1785 (probably India).—Schneider, Syst. Ichth. Bloch, p. 131, 1801 (Indian Ocean).

Zygaena platycephala Van Hasselt, Algemein Konst. Letterbode, May 1823, p. — (type locality: Java); Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824 (Java).

Zygaena laticeps Cantor, Quart. Med. Journ. Calcutta, p. 315, pls. 1–3, 1837 (young) (type locality: Calcutta).

Zygana laticeps Swainson, Nat. Hist. Animals, vol. 1, p. 134, fig. 11, 1838 (head); vol. 2, p. 318, fig. 97, 1839 (dorsal view).

Depth 5⅗ to 5¾ to subcaudal origin; head 3½ to 4¼, 2⅚ to 3 in its width. Snout length in profile 5½ in head; eye about 7½ to 10, 6 to nostril; mouth width 2 to 2½ in head, length 1½ to 2 in its width, no labial folds; about 28 rows of upper teeth, 24 rows, broadly triangular, inclined, each with outer notch; nostrils much nearer mouth than eyes, internarial 2⅘ in head width; snout tip to mouth subequal with oculonarial expansion and front edge or between nostrils broadly rounded as seen from above. Last 2 gill openings over pectoral.

First dorsal inserted over pectoral base posteriorly, front edge 3⅛ to 3⅕ to subcaudal origin; second dorsal length 1¾ to 2 in head, origin opposite first third in anal base; anal length 1⅔ to 1⅞ in head; least depth of caudal peduncle 3¼ to 3⅔; pectoral 1⅕ in head to second gill opening with age, width 1⅞ to 2⅓ its length; ventral 1¾ to 2⅕ in head to first gill opening; caudal 2 in rest of body, subcaudal 2⅖ to 2¾ in caudal.

Dusky or gray brown above, below whitish. In young edges above of oculonarial expansion, anal, caudal and paired fins all narrowly paler.

India, Ceylon, Pinang, Singapore, East Indies, Indochina, Queensland.

1 example. A.N.S.P. Pondicherry, India. June 9, 1840. Thomas Ryan. Dry skin, 1,284 mm.

1 example. A.N.S.P. Bombay. Dr. F. Hallberg. Length, 347 mm.

Order CYCLOSPONDYLI

Eyes without nictitating membranes. Gill openings before pectorals. Spiracle present. Vertebrae with calcareous lamellae arranged in a ring about central axis. Two dorsal fins, with or without spines. No anal. Caudal bent upward, lower lobe little developed. Pectoral normal, not expanded or deeply notched.

ANALYSIS OF FAMILIES

a^1. Each of 2 dorsals with spine; snout moderate to long____________ Squalidae
a^2. Each of 2 dorsals spineless; snout short________________________ Dalatiidae

Family SQUALIDAE

Body usually elongate, partly rounded. Tail slender, compressed. Head depressed. Eyes lateral, without nictitating membrane. Mouth inferior, rather large, moderately arched, with deep labial folds and deep groove at each angle, slightly protrusible. Teeth compressed, variously formed, oblique, erect, with one or more cusps. Nostrils inferior, separate, remote and not joined with mouth. Gill openings moderate or narrow, all before pectorals. Spiracles rather large Dorsal fins 2, each with spine in front, first dorsal before ventrals. No anal. Lower caudal lobe small or obsolete. Ventrals inserted posteriorly, not much before second dorsal.

Small sharks, mostly of cool or temperate seas or deep water. The more typical genera usually known by the presence of a strong spine at the front of each dorsal fin. Many are gregarious. Many fragments as fossils, usually as teeth or spines, all from late Tertiary deposits.

ANALYSIS OF GENERA

- a^1. ETMOPTERINAE. Dorsal spines with lateral grooves; notch below terminal part of caudal.
  - b^1. Teeth unicuspid, unlike in 2 jaws; nostrils oblique.
    - c^1. Inner pectoral angles not extended; nostrils oblique.
      - d^1. Scale crowns pinacoid, rounded, excavated or smooth, on slender peduncles______________________________________ **Centroscymnus**
      - d^2. Scales pedunculate, with 3 strong, extended keels______ **Scymnodon**
    - c^2. Inner pectoral angles not or scarcely extended; nostrils transverse.
      - e^1. Scales leaf-shaped, stalked, with strong median keel_ **Centrophorus**
      - e^2. Scales tricuspid, tridigitate, slender in stalk and cusp; snout much produced____ **Deania**
    - c^3. Inner pectoral angles extended; scales subsessile, with converging keels and stout peduncle__________________________________ **Entoxychirus**
  - b^2. Teeth pluricuspid; nostrils slightly oblique.
    - f^1. Teeth pluricuspid only in upper jaws______________ **Etmopterus**
    - f^2. Teeth pluricuspid in both jaws_________________ **Centroscyllium**
- a^2. Dorsal spines without lateral grooves; caudal not notched subterminally below.
  - g^1. SQUALINAE. Body subrounded; dermal folds on tail, if present; teeth alike in both jaws___________________________ **Squalus**
  - g^2. OXYNOTINAE. Body subtriangular, dermal fold each side; teeth unlike in 2 jaws; first dorsal spine inclined forward. **Oxynotus**

Genus CENTROSCYMNUS Bocage and Capello

Centroscymnus BOCAGE and CAPELLO, Proc. Zool. Soc. London, 1864, p. 263. (Type, *Centroscymnus coelolepis* Bocage, monotypic.)

Body partly fusiform, slightly compressed. Snout produced. Eye large, with nictitating membrane, pupil circular. Mouth transverse, slightly curved, deep groove and labial fold at each angle. Teeth unlike in 2 jaws; upper raptorial, small, lanceolate, in 3 groups, middle one of which outside (in front) of lower jaws; lower sectorial, broad, with oblique triangular cusps. Nostrils oblique, distinct from mouth cavity. Spiracles moderate, with large prespiracular cavity extending forward to orbit. Body scales pedicellate, crown depressed and smooth above pedicel, edges striate to carinate; head with sessile and carinate scales. Dorsals small, spines hardly visible or hidden. No anal. Caudal rather short and deep, with subcaudal. Pectorals small, inner angle not extended.

ANALYSIS OF SPECIES

a^1. Preoral length longer than postocular to first gill opening; first dorsal smaller than second dorsal which inserted over midventral base-------- owstonii

a^2. Pectoral length equals postocular to first gill opening; dorsals equal, second inserted opposite hind end of ventral base------------------------ fuscus

CENTROSCYMNUS OWSTONII Garman

Centroscymnus owstonii GARMAN, Bull. Mus. Comp. Zool., vol. 46, p. 207, 1906 (type locality: Yenoura, Suruga Gulf, Sagami Bay).—PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 671, text fig. 4, 1908 (head below) (Japan).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 205, pl. 13, figs. 5–8, 1913 (type).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (reference).

Centroscymnus owstoni REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 49, 1908 (reference).

Depth 6⅕ to subcaudal origin; head 4⅓, width 1¾. Snout 3 in head; orbit 3⅛, 1⅛ in snout, 1⅔ in interorbital; mouth width 2⅖ in head, moderately curved, deep groove at each angle; labial folds short, upper longer, hidden by groove; teeth in 72 rows above, 36 below, narrow upper lanceolate in 3 groups separated by smaller teeth, median group widest and most prominent and functions outside (in front) of lower jaws, lateral groups narrower and function inside (between) lower jaws; lower teeth wide, compressed, single series functional except when about to be shed, cusps obliquely directed outward; nostrils oblique, small, first ⅖ in snout, valve broad, internarial 2¼ in preoral length, which 2⅙ in head; interorbital 2⅓, low. Gill openings small, ⅓ of orbit, before pectoral. Spiracle medium, backward and above from eye, externally separated from orbit by twice their width.

Scales pedicellate, on flanks and back comparatively smooth and rounded above pedicel; over head, shoulder, and belly with 3 to 5 weak keels.

First dorsal origin about opposite depressed pectoral tip, height half length of free portion which long as base, fin length 1⅖ in head; second dorsal origin over middle of ventral base, fin length 1¼ in head, height equals 1½ height of first dorsal; dorsal spines weak, very little exerted; caudal 3⅖ in rest of body, front subcaudal edge half of fin; least depth of caudal peduncle 5 in head; pectoral 1⅗, width 2 in length; ventral length 1⅛ in head.

Dark brown, slightly mottled and clouded. Length 794 mm. (Garman.)

Japan. The type, M. C. Z. No. 1037, is the only specimen known.

CENTROSCYMNUS FUSCUS Gilchrist and Von Bonde

Centroscymnus fuscus Gilchrist and Von Bonde, Rep. Fishes Marine Biol. Surv. South Africa, No. 3, p. 2, 1924 (type locality: off St. Helena Bay, lat. 32° S., long. 16° E., South Africa in 280 fathoms).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 51, 1925 (compiled).

Body subfusiform, moderately robust. Snout broadly rounded anteriorly, moderate, depressed; eye large, orbit elongate and ⅗ in snout; mouth wide, slightly greater than preoral length, with deep grooves laterally, labial folds at each angle; upper teeth acutely pointed from broad bases, lower broad, compressed, directed obliquely toward mouth angles; nostrils oblique, at end of first quarter of preoral, which equals postocular to first gill opening. Gill openings narrow, equidistant, before pectoral. Spiracle ¼ orbit.

Scales pedicellate, on body concave, on dorsal surface of head with 3 to 5 keels, on spaces between gills very small and weakly keeled, on ventral side of head 3 to 5 keeled up to line running between second gill openings of each side; all fins scaled with concave scales which absent from pectoral axils.

Dorsal spines small, ends exposed; base of first dorsal equals height; second dorsal distant from first 6½ times base of first, apparently (damaged) equals first dorsal, origin opposite end of ventral base; subcaudal (damaged) large, apparently slightly separated from terminal caudal portion by notch; pectoral medium, not reaching first dorsal origin, hind angle rounded; ventral base broad, long as first dorsal.

Uniform brown. Length 1,100 mm. (Gilchrist and Von Bonde.)

South Africa. Only the type known, in the Government Marine Survey of South Africa.

Genus SCYMNODON Bocage and Capello

Scymnodon Bocage and Capello, Mem. Acad. Real. Sci. Lisboa, vol. 3 (1864), p. 3, 1865. (Type, *Scymnodon ringens* Bocage and Capello, monotypic.)

Zameus Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 632, 1903. (Type, *Centrophorus squamulosus* Günther, orthotypic.)

Proscymnodon Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 239, 1933. (Type, *Centrophorus plunketi* Waite, orthotypic.)

Body slightly triangular in cross section. Head flattened on crown, wide posteriorly. Mouth large, arched forward, with deep straight groove at each angle and with labial folds. Teeth unlike in

2 jaws; upper awl-shaped, raptorial; lower compressed, smooth on edges, sectorial, more or less oblique. Nostrils below snout, oblique, well advanced. Spiracles large, behind eyes, elevated. Two small dorsals, with spine shortly exposed. Caudal well developed, vertebral axis raised backward, subcaudal lobe rather weak.

Small sharks, usually of deep water. The dorsal spines are often weak or poorly developed. *Zameus* based primarily on scale structure is not distinct from *Scymnodon.* Garman includes *Centroscymnus macracanthus* Regan from Magellan Straits, placing it near *Scymnodon plunketi*, though its well developed dorsal spines strongly projecting.

ANALYSIS OF SPECIES

*a*¹ Second dorsal origin behind ventral origin; pectoral not reaching second dorsal origin.
  *b*¹. ZAMEUS. Orbit more than half snout.
    *c*¹. First dorsal origin nearly midway between hind orbital angle and second dorsal origin or nearly midway between snout tip and hind end of second dorsal; second dorsal and ventral subequal______ squamulosus
    *c*². First dorsal origin midway between last gill opening and second dorsal origin or midway between snout tip and end of last caudal vertebra. sherwoodi
  *b*². SCYMNODON. Orbit less than half of snout; first dorsal origin slightly nearer first gill opening than second dorsal origin (east Atlantic)_ ringens
*a*². PROSCYMNODON. Second dorsal origin above or close behind ventral origin, fin greatly larger than ventrals; pectoral nearly reaches opposite first dorsal origin which at first third in total length; orbit nearly long as snout. plunketi

Sub genus ZAMEUS Jordan and Fowler

SCYMNODON SQUAMULOSUS (Günther)

Centrophorus squamulosus GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 20, p. 433, 1877 (type locality: Off Inosima, Japan); Rep. Voy. *Challenger*, vol. 22, p. 5, pl. 2, fig. B, 1887 (lat. 35° 11′ N., long. 139° 28′ E., in 345 fathoms).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, pp. 41, 129, 1901 (Enoshima).

Zameus squamulosus JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 633, 1903 (compiled).

Scymnodon squamulosus REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 48, 1908 (Atlantic coasts Europe).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 209, 1913 (Japan).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (references).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 7, 1931 (Misaki; Sagami Bay).

Depth 5⅔ to subcaudal origin; head 4½, width about 2⅕. Snout 3¾ in head; orbit 5¼, 1½ in snout, about 2⅖ in interorbital; mouth width about 2¾ in head, rather long deep groove at each angle, upper labial fold about half jaw length, lower ⅖ jaw length; upper lip with fringed edge; teeth entire, upper narrower and more erect, lower broader with triangular cusp on subquadrangular base; nostrils midway in snout, oblique, small narrowly triangular flap in middle of front valve; internarial 2⅔ in preoral length, which 2¼ in head; interorbital 2⅕, rather low. Gill openings about ½ orbit, upper ends before pectoral. Spiracle little above eye and length of orbit behind orbit.

Scales minute, tricarinate and with 3 points, median largest.

First dorsal origin midway between spiracle and second dorsal origin, fin length 1⅚ in head, lower than second dorsal; second dorsal origin over hind basal edge of ventral, fin length 1½ in head; caudal 3⅗ in rest of body, front subcaudal edge 2 in caudal length; least depth of caudal peduncle 4⅘ in head; pectoral 1⅔, reaches about 1½ to first dorsal origin; ventral length 1½ in head.

Uniform deep black. Length, 690 mm. (Günther.)

Japan, eastern Altantic.

SCYMNODON SHERWOODI Archey

Scymnodon sherwoodi ARCHEY, Trans. New Zealand Inst., vol. 53, p. 195, pl. 39, text figs. 1–2, 1921 (type locality: New Brighton, New Zealand).—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 10, p. 225, fig. 7, 1928 (New Brighton beach).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Depth 5⅛ to subcaudal origin; head 4½, width about 1⅓. Snout 3⅓ in head; orbit 4⅗, 1⅖ in snout, about 3 in interorbital; mouth width about 1⅗ in head, with deep groove at each angle, upper labial fold about 2 in jaw, lower about 2½ in jaw; upper teeth rather long, slender, lower broader and inclined laterally; nostrils nearer orbit than snout tip, about first third in preoral length, internarial 1⅘ in preoral length, which 2⅖ in head; interorbital low, about 1¼ in head. Gill openings equidistant, 1¼ in orbit, last before pectoral.

Scales pedunculate, with 3 parallel keels, each ends in point, central keel longest.

First dorsal origin midway between last gill opening and second dorsal origin, fin length 2 in head; second dorsal origin over middle of ventral base, fin length 2 in head; caudal 3¾ in rest of body, front subcaudal edge 2⅓ in caudal length; least depth of caudal peduncle 6¾ in head; pectoral 1⅞, width 2⅛ its length, which reaches 2¼ to first dorsal origin; ventral length 1⅘ in head; claspers subterminally each with curved sharp claw, opposite middle of free posterior edge of second dorsal.

Dark brown, with 2 submedian lighter areas extending from below gill openings to ventrals. Angles of gill openings tipped dirty white. Hind angle and hind border of pectorals with narrow dirty white margin. Length, 803 mm. (Archey.)

New Zealand.

Subgenus PROSCYMNODON Fowler

Second dorsal origin above ventral origin, fin greatly larger than ventral. Dorsal spines short, not half height of fins. Pectoral nearly reaches opposite first dorsal origin, which at first third in total length. Orbit but little shorter than snout.

SCYMNODON PLUNKETI (Waite)

Centrophorus plunketi Waite, Trans. New Zealand Inst., vol. 42, 1909, p. 384, 3 text figs. (mouth, teeth, scales), pl. 37, 1910 (type locality: off Kaikoura, New Zealand); vol. 46, 1913, p. 127, pl. 3, 1914 (young) (Kaikoura).—Phillipps, New Zealand Journ. Sci. Techn., vol. 10, p. 225, fig. 6, 1928 (off Kaikoura).

Scymnodon plunketi Garman, Mem. Mus. Comp. Zool., vol. 36, p. 210, 1913 (compiled).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (reference).

Proscymnodon plunketi Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Depth $5\frac{3}{5}$ to subcaudal origin; head $5\frac{2}{5}$, width about $1\frac{1}{8}$. Snout $3\frac{4}{5}$ in head; orbit $3\frac{1}{2}$, slightly greater than snout; mouth width equals preoral length, which $2\frac{1}{8}$ in head, deep groove and labial fold at each mouth angle, lower little shorter; upper teeth small, very acute, in 4 rows, 2 rooted; lower teeth in single row of 30, form upper oblique cutting edge with laterally directed cusp; nostrils midway in snout length, inferior, internarial $1\frac{9}{10}$ in preoral length; interorbital low. Gill openings equidistant, half of orbit, before pectoral. Spiracle large, orbital length posterior to eye.

Scales on snout tip granular, mosaiclike, on head otherwise and rest of body and fins imbricate, strongly tricarinate and tricuspid; lateral ridges and cusps strong as median, not quite so long; each scale with many as 8 roots.

First dorsal origin slightly behind depressed pectoral tip, fin length equals head; second dorsal origin opposite ventral origin, fin length equals head to third gill opening, little higher than first dorsal height; caudal $3\frac{1}{5}$ in rest of body, front subcaudal edge $1\frac{2}{3}$ in caudal length; pectoral equals head to first gill opening, width $2\frac{1}{5}$ its length; ventral length $1\frac{1}{2}$ in head; least depth of caudal peduncle 3.

Uniform dark brown. Length 1,414 mm. (Waite.)

Off Rileys Islands, New Zealand.

Genus CENTROPHORUS Müller and Henle

Centrophorus Müller and Henle, Arch. Naturg., 1837, p. 398. (Type, *Squalus granulosus* Schneider, monotypic.) Syst. Beschr. Plagiostomen, p. 88, 1841. (Type, *Squalus squamosus* Bonnaterre, designated by Swainson, Nat. Hist. Animals, vol. 1, p. 146, 1838, invalid.)

Lepidorhinus Bonaparte, Nuov. Ann. Sci. Nat. Bologna, vol. 2, p. 207, 1838. (Type, *Squalus squamosus* Bonnaterre, monotypic.)

Machephilus Johnson, Proc. Zool. Soc. London, 1867, p. 713. (Type, *Machephilus dumerilli* Johnson, monotypic.)

Body elongate, partly rounded. Tail short. Head depressed. Snout rather wide, rounded terminally. Eyes large, without nictitating folds. Mouth large, arched, deep labial fold and groove at each mouth angle. Teeth sectorial, unlike in 2 jaws; upper pointed, cusp more erect; lower wider, cusp directed toward mouth angles; median tooth present above and below. Gill openings moderate, before pectoral. Scales small, close together, leaf-shaped, pedunculate on trunk, with strong median keel and weaker laterals, sessile with convergent keels on snout. Dorsals elongate, first near pectorals. Caudal short, deep, subcaudal lobe not produced. Pectorals small, inner angle little produced.

Small deep-sea sharks, known chiefly by their leaflike scales.

The following imperfectly known nominal species, described briefly, without reference to dentition and squamation, though mentioning the first dorsal with a large black spot, is based on a fetus 424 mm. long. Günther says "No distinctive characters can be given from a single undeveloped example which is not in good condition" and which he lists as "type of *Centrophorus moluccensis*, Blkr." It is admitted by Regan and placed next to *Centrophorus tessellatus* Garman with the statement "in the British Museum one specimen, 210 mm. in total length, type of the species."

Centrophorus moluccensis BLEEKER, Act. Soc. Sci. Indo-Néerland. (Amboina), vol. 8, p. 3, 1860 (fetus) (type locality: Amboina).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 54, 1908 (type).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 201, 1913 (copied).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (reference).

Centrophorus granulosus (not Schneider) DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 448, 1865 (note).—GÜNTHER, Cat. Fishes British Museum, vol. 8, p. 420, 1870 (types of *Centrophorus moluccensis*).

ANALYSIS OF SPECIES

a^1. First dorsal higher than second; snout and eye subequal; snout 3⅔ in head; mouth width ⅔ (New Zealand) ---------------------------------- nilsoni
a^2. Second dorsal high as first dorsal.
  b^1. Second dorsal base ⅗ of space to supracaudal origin (Japan) - tessellatus
  b^2. Second dorsal base twice space to supracaudal origin (Eastern Atlantic). granulosus
a^3. Second dorsal little higher than first.
  c^1. Snout much shorter than orbit (Japan) ------------------ steindachneri
  c^2. Snout greatly longer than orbit.
    d^1. Mouth width 2⅗ to 2¾ in head.
      e^1. Snout 3⅘ in head (Japan) ---------------------------------- rossi
      e^2. Snout 2⅓ in head (New Zealand) ---------------------- kaikourae
    d^2. Mouth width 4 in head; snout 3½ in head (New Zealand) ----- waitei
a^4. Second dorsal barely over ½ or more height of first dorsal.
      f^1. Orbit 2½ in interorbital (Australia) ------------------ scalpratus
      f^2. Orbit 1¾ in interorbital (Japan) ---------------------- foliaceus

CENTROPHORUS NILSONI Thompson

Centrophorus nilsoni THOMPSON, Rec. Canterbury Mus., vol. 3, No. 4, p. 276, pl. 44, figs. a-i, 1930 (type locality: Deep water off Kaikoura).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Depth 5¾ to origin of lower caudal lobe; head to first gill opening 5, width 1⅕. Snout 3⅔ in head; eye 3⅔, subequal with snout, 2 in interorbital; mouth width 2⅓ in head to first gill opening, little curved; labial folds extend ⅓ along both upper and lower jaws, and backward projection from angle same length; upper jaw with 4 rows of lanceolate teeth bearing lateral extensions near base, while almost straight up and down in front take distinct slope toward angle of mouth at sides of jaw; lower teeth in 2 rows with inner lateral edges deflected over to form cutting edge of tooth till at angles of 20° with jaw and median tooth present in outer set; interorbital 1⁹⁄₁₀ in head to first gill opening, low. Gill openings increase in size posteriorly so last nearly twice long as first. Spiracle long, wide, above and well behind eye.

Body covered with smallish leaf-shaped scales, mostly with one strong median and 2 less marked lateral keels. In most of scales keels end in lobes, but these absent on part of snout.

First dorsal length from spine 1 in head to first gill opening, fin base 2 in interorbital space, moderately high; second dorsal length 1⅗ in head to first gill opening, moderately high, fin extends ²⁄₇ caudal length; both dorsal spines low, largely covered, half fin height; caudal length 3⅘ in rest of fish, subcaudal length 1⅔ in caudal; anal 1⅓, posterior tip reaching below middle of second dorsal; pectoral 1⅓ in head to first gill opening.

Brown on back and sides, very light brown below. Inside mouth and eye sockets white.

Length, 103 cm. (Thompson.)

New Zealand.

CENTROPHORUS TESSELLATUS Garman

Centrophorus tessellatus GARMAN, Bull. Mus. Comp. Zool., vol. 46, p. 205, 1906 (type locality: Lat. 35° N., long. 139° 30′ E., in 400 fathoms).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 54, 1908 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 202, 1913 (type).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (reference).

Body subfusiform, robust; head including gill opening 4 in total, depressed, flattened below and on crown, sides steep. Snout long, broad, bluntly rounded at end; eye large, less than half preoral length, hind end of orbit above mouth; mouth width ⅗ of preoral length, little curved, at each angle long deep straight groove with labial folds extends ⅓ length of each jaw; teeth in 41 rows above, 31 below, compressed, serrated on basal portions of each cusp; upper teeth erect in middle of mouth, oblique towards angles, each tooth with slender pointed broader based cusp; lower teeth broader, oblique, inner or cutting edge convex or serrated, ending in sharp smooth edged cusp at outward extremity; nostrils nearly transverse, valve with oblique angular lobe bearing on inner side lobule, internarial equals their distance from snout end or less than ⅔ of space from mouth. Gill openings small, first about ⅓ of orbit, last nearly twice wide as first, much wider than fourth, before pectoral. Spiracles moderate, semilunate, distant 1½ times their diameter from orbit.

Scales somewhat rough, with 5 to 9 converging keels or striae on those of head and shoulders; farther back apices smooth from wear, remains of striae surround base.

First dorsal reaches little beyond middle in total length, base ⅘ of outer pectoral edge, upper angle rounded, acute hind angle extended; second dorsal long as and height ⅘ of first dorsal height, similar, base ⅗ of distance from caudal; caudal with well-developed subcaudal; pectoral wide, acuminate inner angle very long, hind edge otherwise slightly concave; ventrals reach below second dorsal spine, hind edge concave, ends acute; claspers short, ends slender and pointed with short slender spine near end on outer side.

Back and flanks brownish, lower surfaces white. White border on fins and gill covers. Length 875 mm. (Garman.)

East of Japan.

CENTROPHORUS GRANULOSUS (Schneider)

Squalus granulosus SCHNEIDER, Syst. Ichth. Bloch, p. 135, 1801 (no locality given).

Etmopterus granulosus BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 49, 1925 (off Cape Point, to 800 fathoms).

Spinax granulosus NORMAN, *Discovery* Rep., vol. 12, p. 37, 1935 (lat. 34° 8′ S., long. 17° 33′ E., in 402–548 m.).

Centrophorus granulosus FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 73, 1936 (Mediterranean).

Depth 7⅖; head 5¼. Snout 3 in head; orbit 4, long narrow slit; mouth broadly transverse, slightly convex, each angle with deep groove ⅔ to first gill opening; teeth rather fine; upper teeth erect, small, well compressed, rather broadly triangular, directed laterally so inner margin forms cutting edge and outer edge of each tooth deeply notched; large nostrils equal about half of internasal which 1⅚ in preoral, nostrils at first third in preoral. Last gill opening longest, above pectoral base. Spiracle large, little above hind edge of eyelid and distant about its own length.

Scales 3 to 6 keeled, many keels often more or less obsolete.

First dorsal spine inserted midway between snout tip and origin of second dorsal spine, latter much nearer caudal vertebra than hind basal edge of first dorsal or well behind ventral base; caudal broad, inserted well behind origin of lower lobe; subcaudal lobe ⅓ of caudal fin; pectoral reaches middle of first dorsal base, width slightly less than half its length; ventral inserted near last ⅖ between hind basal edge of first dorsal and origin of second dorsal spine.

Light brownish to cinnamon brown, paler on belly and lower surface of head.

Eastern Atlantic, Mediterranean, South Africa.

A.N.S.P., one example. Italy. C. L. Bonaparte collection. No. 42. Dr. T. B. Wilson. Length, 843 mm. Dried skin.

A.N.S.P., one example. No data. Dried skin.

CENTROPHORUS STEINDACHNERI Pietschmann

Centrophorus steindachneri PIETSCHMANN, Anz. Akad. Wiss. Wien, vol. 44, p. 394, 1907 (type locality: Japan); Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 667, pl. 1, fig. 1, 1908 (type).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 53, 1908 (reference).

Lepidorhinus steindachneri GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 213, 1913 (Japan).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (reference).

Depth 5⅘ to subcaudal origin; head 3⅘. Snout 3⅘ in head; orbit 3, little greater than snout; mouth broadly curved, with deep groove and labial folds at each angle, upper fold less than half jaw length, lower slightly less than upper; teeth sectorial, median shaped as isosceles triangle and nearly erect, become more oblique laterally, lower much more oblique and nearly twice as broad; nostrils much nearer snout tip than mouth; interorbital low. Gill openings about ⅖ of orbit, last 2 closer, before pectoral. Spiracle above though close behind eye.

Scales small, leaf-shaped, with strong median keel and weaker lateral keels, hind edge with 3 points of which median longest.

First dorsal origin behind pectoral base, fin length 1⅖ in head; second dorsal origin opposite hind basal ventral edge, fin length 1⅗ in head, subequal in height with first dorsal; caudal 2⅞ in rest of body, front subcaudal edge 1⅘ in caudal length; least depth of caudal peduncle 4¾ in head; pectoral length 1⅗; ventral length 2.

Grayish brown. Length, 432 mm. (Pietschmann; Garman.)

Japan.

CENTROPHORUS ROSSI Alcock

Centrophorus rossi ALCOCK, Ann. Mag. Nat. Hist., ser. 7, vol. 2, p. 143, 1898 (type locality: Off Travancore coast in 430 fathoms); Illustr. Zool. *Investigator*, pt. 3, pl. 26, fig. 3a-c, 1895; Cat. Deep Sea Fishes Indian Mus., p. 13, 1899 (type).

Lepidorhinus rossi GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 214, 1913 (compiled).

Centroscymnus crepidater (part) REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 50, 1908 (on Alcock).

Depth 5¾ to subcaudal origin; head 3, width 1¾. Snout 2¼ in head; orbit 4, 1⅘ in snout, about 1⅘ in interorbital; mouth width 2⅔ in head, crescentic, protractile, upper labial fold ⅔ upper jaw, lower about ⅖ lower jaw; upper teeth acute, triangular, in 2 series, lower very oblique and uniserial; nostrils inferior, about first fourth in preoral length, valve short point on hind edge, internarial 3⅘ in preoral length, which 1⅗ in head; interorbital 2, low. Gill openings about ⅖ of orbit, last 2 closer and before pectoral. Spiracle oblique slit half orbit, begins opposite hind eye edge to which superior.

Scales minute, acutely tridentate or anchor shaped.

First dorsal origin close behind pectoral base, fin length 1⅘ in head; second dorsal origin opposite midventral base, fin length 1⅘ in head, higher than first dorsal; caudal 2⅘ in rest of body, front subcaudal edge 2½ in caudal length; least depth of caudal peduncle 5⅘ in head; pectoral 1⅞, width about ½ its length; ventral length 2½.

Uniform jet black. Length, 254 mm. (Alcock.)

Off Travancore coast, India. Only the type known.

CENTROPHORUS KAIKOURAE Whitley

Centrophorus kaikourae WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (on Thompson).

Centrophorus calceus (not Lowe) THOMPSON, Rec. Canterbury Mus., vol. 3, No. 4, p. 275, pl. 42, figs. a-i, 1930 (type locality: Deep water, off Kaikoura).

Depth 7⅒ to subcaudal origin; head to first gill opening 3⅕, width 2. Snout 2⅓ in head; eye 5⅞, 3 in snout, 2⅕ in interorbital; mouth width 4 in head to first gill opening, little curved; preoral length 1⅗; labial fold extends a little way along both jaws and upper and lower folds approximately equal in length, with upper continued back in straight line past mouth angle to distance ⅔ of preoral fold; upper teeth in 2 functional sets and one developing set, triangular in shape, descending to broad base; lower teeth in 2 rows, close together, without median tooth and inner lateral edge greatly inclined outward to form cutting edge of tooth; interorbital 2⅔ in head to first gill opening, low. Gill clefts fairly wide, subequal. Spiracle opening wide, behind and slightly above eye.

Body covered with small, tricuspid scales mounted on moderately long stalks; median cusp directed backward, and 2 lateral ones backwardly and laterally inclined. On top of snout and edges of jaws flattened, knob-shaped scales.

First dorsal length from spine 1¼ in head to first gill opening, fin base 1$\frac{3}{7}$ in interdorsal space, fin long, low, height ¾ of eye socket, spine ¾ of fin height; second dorsal higher and shorter, length 2 in head to first gill opening, long curved spine high as posterior fin which extends ¼ caudal length; caudal 1$\frac{1}{6}$ in head to first gill opening, anal 2; subcaudal length 2 in caudal; pectoral 1$\frac{9}{10}$ in head to first gill opening.

Uniform dark brown. Inside eye socket gray black, like internal margins of gill clefts. Mouth with patches of gray black.

Length, 107 cm. (Thompson.)

New Zealand.

CENTROPHORUS WAITEI Thompson

Centrophorus waitei Thompson, Rec. Canterbury Mus., vol. 3, No. 4, p. 277, pl. 44, figs. a-k, 1930 (type locality: Deep water, off Kaikoura).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Depth 6$\frac{1}{6}$ to subcaudal origin; head to first gill opening 4⅛, width 1⅗. Snout 3½ in head; eye 4, 1¼ in snout, 2 in interorbital; mouth width 2⅗ in head to first gill opening, wide; preoral length 2⅔; labial fold extends well along edges of both jaws, on upper portion not so marginated, shorter than other portion; upper teeth small, very acute, in 4 irregular rows; lower teeth with upper oblique cutting edge and laterally directed cusp and oblique cutting edge parallel to jaw; interorbital 2¼ in head to first gill opening, low, little convex in profile; nostrils ventral, close to snout tip and near its edge, internasal space slightly greater than eye. Gills subequal, last one ⅔ of eye. Spiracle large, rather nearer eye than gill opening.

Scales variable; on lower lip like blunt spear head, overlap closely showing little median keel; on upper lip similar, but with strong median keel; on lateral ventral surface 3-pronged with little "palm," prongs subequal; on middorsal part of middle of body tricuspid, only moderately carinate, with median finger longest and "palm" considerable.

First dorsal 2¼ in head to first gill opening, 2½ in interdorsal space, fin low; second dorsal 2 in head to first gill opening or 1¼ to subcaudal origin; dorsal spines moderate, ⅔ height of respective fins; anal 1¾ in head to first gill opening, hind tip reaches opposite second dorsal spine, fin 2 to subcaudal origin; caudal 2⅔ in rest of fish, front edge of subcaudal 2⅓ in caudal length; least depth of caudal peduncle 6⅓ in head to first gill opening; pectoral 1⅗.

Brownish-black all over. Inside of mouth, edge of nostrils and eyes blue gray. Assumes a brownish-gray appearance on drying.

Length, 320 mm. (Thompson.)

New Zealand. Said to resemble *C. plunketi* Waite in the tail though the shape of the caudal fin, pectoral, and teeth different.

CENTROPHORUS SCALPRATUS McCulloch

Centrophorus scalpratus McCulloch, Biol. Res. *Endeavour*, vol. 3, pt. 3, p. 97, pl. 13, figs. 2–7, 1915 (type locality: Victorian coast, in 70–80 fathoms).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (copied).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1930 (reference).

Depth 7 to subcaudal origin; head 4⅞, width 1⅖. Snout 3 in head; orbit 3½, 1⅕ in snout, about 2½ in interorbital; mouth width 1⅞ in head, very slightly arched, with deep groove and short labial folds at each angle; oblique lateral groove extends backward behind spiracle, long as ⅔ mouth width; teeth compressed, upper much smaller than lower with symphyseal triangular, erect, edges entire, other more oblique toward sides, lateral cutting edge almost horizontal; lower teeth with nearly horizontal cutting edge, margins of cusps serrated; nostrils midway in snout, front nasal flap with 2 lobes near outer edge, inner one smaller, hind nasal edge with narrow skinny border and large rounded externo-internal prominence; internarial 2½ in preoral length, which 1⅗ in head; interorbital 1⅗, low. Gill openings larger and closer backward, last widest or ⅗ of orbit, before pectoral. Spiracle large, subtriangular, above and little behind orbit.

Scales small, depressed, pointed posteriorly, upper surface rough with several keels converging towards point.

First dorsal origin well behind pectoral base, fin length equals head; second dorsal length 2⅕, entirely behind depressed ventral; caudal 3⅗ in rest of body, front subcaudal edge 2 in caudal length; least depth of caudal peduncle 5 in head; pectoral length 1⅕, width 2⅒, inner slender pectoral angle reaches half way in first dorsal base; ventral length 1⅔ in head.

Gray above and on sides, white beneath. Inner pectoral angles white. Length, 907 mm. (McCulloch.)

Victoria. The type was a female 870 mm. long. McCulloch says "these specimens agree with *C. granulosus*, Schneider, in having the cusps of the lower teeth serrated, and they are possibly identical with that species."

CENTROPHORUS FOLIACEUS Günther

Centrophorus foliaceus Günther, Ann. Mag. Nat. Hist., ser. 4, vol. 20, p. 433, 1877 (type locality: Off Inosima, Japan); Rep. Voy. *Challenger*, vol. 22, p. 5, pl. 2, fig. A, 1887 (type, from lat. 35° 11′ N., long. 139° 28′ E., in 125 fathoms).—Jordan and Snyder, Annot Zool. Japon., vol. 3, pp. 41, 129, 1901 (Enoshima).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 53, 1908 (type: Japan).

Lepidorhinus foliaceus JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 631, 1903 (near Misaki).—SMITH and RADCLIFFE, Proc. U. S. Nat. Mus., vol. 41, p. 679, 1912 (between Leyte and Mindanao, in 960 fathoms).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (Philippines and Japan).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 15, 1937 (reference).

Body rather elongate, tail tapering; head to last gill opening 4⅗ in total length, width 1½. Snout 3⅕ in head to last gill opening; eye large, lateral, nearer snout than gill opening, 1¾ in interorbital; mouth width 2½ in head to last gill opening, slightly curved, with deep labial fold at each corner; lower teeth with several small cusps; nostrils large, inferior, nearer eye than snout tip or nearer latter than mouth; preoral length 1¾ in head to last gill opening; interorbital 2, broad, flattened. Gill openings low, before pectorals. Spiracles large, round, interspiracle width 2 in interorbital or 3 in head to last gill opening.

Scales rather large, leaf-shaped, tridentate, keeled in front and on a pedicle; large on trunk above and below, especially enlarged before dorsal.

Both dorsals with sharp spines, only tips exposed; first dorsal origin nearer snout tip than second dorsal base and short space behind pectoral base; caudal 3¼ in rest of body; least depth of caudal peduncle 3 in interorbital; pectoral short, truncate, less than 2 in head; ventrals small, before second dorsal, nearer caudal tip than snout tip.

Uniform gray brown, nostril edges and lower lips blackish. Length, 361 mm. (Jordan and Fowler.)

Japan, Philippines.

Genus DEANIA Jordan and Snyder

Deania JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 25, p. 80, 1902. (Type, *Deania eglantina* Jordan and Snyder, monotypic.)

Nasisqualus SMITH and RADCLIFFE, Proc. U. S. Nat. Mus., vol. 41, p. 681, 1912. (Type, *Nasisqualus profundorum* Smith and Radcliffe, monotoypic.)

Deaniops WHITLEY, Rec. Australian Mus., vol. 18, No. 6, p. 326, 1932. (Type, *Acanthidium quadrispinosum* MCCULLOCH, orthotypic.)

Body elongate, partly fusiform, little compressed. Head depressed. Snout produced, longer than rest of head, spoonlike, blunt. Eyes large, without nictitating membranes. Mouth transverse, behind middle of head and with long deep groove each side. Teeth triangular, with single erect or oblique cusp. Nostrils transverse, before middle of head. Gill openings narrow, before pectorals. Spiracles superior, large, behind eyes. Scales very small with slender peduncle on broad polygonal or radiating base, crowned with 3 or 4 slender, acuminate cusps. Two dorsals, with compressed spines which grooved laterally and second spine much larger than first; first dorsal above space between pectorals and ventrals. No anal. Tail much less than body, subcaudal scarcely extended. Pectorals moderate, inner angles not extended.

I cannot accept Garman's use of *Acanthidium* for this genus as its type species *Acanthidium pusillum* Lowe properly conveys it to the synonymy of *Etmopterus*.

ANALYSIS OF SPECIES

- a^1. **DEANIA.** First dorsal origin nearer subcaudal origin than snout tip, well behind depressed pectoral end.
  - b^1. Second dorsal origin over or close behind hind edge of ventral base.
    - c^1. Depressed first dorsal far from opposite ventral origin.
      - d^1. Eye center midway between snout tip and pectoral origin.
        - e^1. Spiracle above level of eye -------------------------- quadrispinosa
        - e^2. Spiracle behind superiorly level of eye ------------------- rostrata
      - d^2. Eye center nearer snout tip than pectoral origin ---------- aciculata
    - c^2. Depressed first dorsal nearly reaches opposite ventral origin -- hystricosa
  - b^2. Second dorsal origin over middle of ventral base --------------- eglantina
- a^2. **NASISQUALUS.** First dorsal origin or spine much nearer snout tip than subcaudal origin or close behind pectoral base.
  - f^1. Second dorsal origin above hind basal ventral edge -- profundorum
  - f^2. Second dorsal origin well behind ventral base -------- natalense.

Subgenus DEANIA Jordan and Snyder

DEANIA QUADRISPINOSA (McCulloch)

Acanthidium quadrispinosum McCULLOCH, Biol. Res. *Endeavour*, vol. 3, pt. 3, p. 100, pl. 14, figs. 5-8, 1915 (type locality: Great Australian Bight and Victorian coast, in 150–300 fathoms).—WAITE, Rec. South Austrian Mus., vol. 2, p. 23, fig. 31, 1921.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (compiled).

Deaniops quadrispinosus WHITLEY, Rec. Australian Mus., vol. 18, No. 6, p. 326, 1932 (type); Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Depth 7 to subcaudal origin; head $3\frac{3}{5}$, width $2\frac{1}{4}$. Snout $1\frac{7}{8}$ in head; eye $4\frac{2}{3}$, $2\frac{2}{5}$ in snout, $1\frac{1}{2}$ in interorbital; mouth width $3\frac{2}{3}$ in head, slightly arched, long upper and short labial fold at each angle; upper teeth little smaller than lower, with pointed cusps arising from broad bases, nearly all upright, become slightly oblique laterally; lower teeth in male very similar to upper, somewhat broader and little more oblique laterally, in female cutting edges almost horizontal with tips turned slightly upward; preoral length $1\frac{3}{5}$ in head; nostrils little nearer orbit than snout end, internarial $3\frac{3}{5}$ in preoral length, inner portions with free skinny borders; interorbital 3 in head, low. Gill openings subequal, equidistant, width about $\frac{2}{5}$ or orbit. Spiracle large, behind end of orbit, about half diameter above.

Scales with 4 spines, of which 1 broad and leaflike, on stellate bases with slender peduncles.

First dorsal origin midway between hind end of orbit and ventral origin, fin length 1¾ in head; second dorsal origin behind ventral base, fin length 1⅔ in head, fin little higher than first dorsal; caudal 3⅔ in rest of body, subcaudal 2⅓ in caudal; least depth of caudal peduncle 7 in head; pectoral 2, width 1⅔ its length which reaches about 1⅛ to first dorsal origin; ventral length 2⅘ in head.

Gray above, somewhat lighter beneath. Front portions of dorsals and pectorals somewhat darker in young. Length, 1,138 mm. (McCulloch.)

South Australia, Victoria.

McCulloch had 5 specimens, 2 males and 3 females; the smallest 683 mm., a young male, he selected as type.

DEANIA ROSTRATA (Garman)

Acanthidium rostratum Garman, Bull. Mus. Comp. Zool., vol. 46, p. 206, 1906 (type locality: Suruga Gulf, Japan); Mem. Mus. Comp. Zool., vol. 36, p. 218, pl. 11, figs. 1–4, 1913 (type).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (reference).

Centrophorus rostratus Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 52, 1908 (reference).

Depth 6¼ to subcaudal origin; head 3¾, width 2⅕. Snout 2 in head; eye 5⅖, 2⅘ in snout, 2 in interorbital; mouth width 3⅓ in head, little arched, groove moderate, folds short, upper longer; 34 rows of upper teeth; 30 below, upper triangular with 8 near middle of mouth nearly erect and lateral teeth becoming more oblique, with more of notch on outer edge; lower teeth larger, oblique, cutting edge directed outward nearly horizontally above deep notch on outer edge; nostrils small, midway in snout, each crossed by short angled lobe on inner side of which lies smaller one, internarial 3⅖ in preoral length, which 1⅗ in head; interorbital 2⅘ in head, rather low, flattened at crown. Gill openings moderate, about half orbit. Spiracle large, semilunate, distant its width up and behind orbit.

Scales very small, base stellate to polygonal, peduncle crowned with 3 or 4 acuminate cusps, along outer surface of each a keel.

First dorsal origin midway between hind orbital edge and ventral origin, fin length 1¼ in head; second dorsal length 1⅖, little higher than first dorsal, origin above hind basal edge of anal; caudal 3⅞ in rest of body, subcaudal 2 in caudal length; least depth of caudal peduncle 5½ in head; pectoral 1⅞, width 1¾ its length which reaches 1¼ to dorsal origin; ventral 2 in head.

Ashy brown, probably greenish in life, darker on head, snout, back, and upper parts of fins. Hind border of pectorals whitish, lighter on hind margins and inner angles of other fins. Lower surfaces lighter. Length, 865 mm. (Garman.)

Japan.

DEANIA ACICULATA (Garman)

Acanthidium aciculatum GARMAN, Bull. Mus. Comp. Zool., vol. 46, p. 207, 1906 (type locality: Sagami Bay, Japan); Mem. Mus. Comp. Zool., vol. 36, p. 217, pl. 12, figs. 1–4, 1913 (type).—FOWLER, Proc. 4th Pacific Sci. Congr., Java, p. 496, 1930 (reference).

Centrophorus calceus (part) REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 51, 1908 (on Garman).

Depth 6⅘ to subcaudal origin; head 4, width 1⅞. Snout 2¼ in head; eye 4⅛, 1⅘ in snout, 1⅔ in interorbital; mouth width 2⅗ in head, moderately arched, with deep groove more than half of which anterior and labial folds at each angle; lower labial fold more than half length of jaw, upper shorter and hidden by groove; teeth 30 rows above, 31 rows below, upper with sharp erect triangular cusps rising from middle of cutting edges, broadening at bases, little more oblique near angles; below group of sharp pointed teeth near symphysis, become slightly oblique toward mouth corners and cusp base much broader than central portion; preoral length 1⅔ in head; nostrils small, midway in snout, internarial 2⅞ in preoral length, front valve with short pointed lobe crossing nostril; interorbital 2½, low. Gill openings narrow, subequal, ⅓ of orbit, before pectoral. Spiracle large, distant less than diameter from corner of eye, valve with laminaelike gills.

Scales very small, slender, pedunculate, each with 3 slender, sharp cusps.

First dorsal origin midway between front spiracle edge and ventral origin, fin length equals head, height about ⅕ its length; second dorsal begins close behind ventral base, length 1⅖ in head, higher than first dorsal; caudal equals head to second gill opening or 4 in rest of body, subcaudal 2½ in caudal length; least depth of caudal peduncle 5¾ in head to first gill opening; pectoral 2, width 1½ its length which reaches about ⅔ to first dorsal origin; ventral 1¾ in head, clasper rather slender, shorter than ventral.

Uniform brown. Length, 868 mm. (Garman.)

Japan.

DEANIA HYSTRICOSA (Garman)

Acanthidium hystricosum GARMAN, Bull. Mus. Comp. Zool., vol. 46, p. 206, 1906 (type locality: Sagami Bay).—PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 661, 1908 (Japan).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 220, pl. 11, figs. 5–8, 1913 (type).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (reference).

Centrophorus hystricosus REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 51, 1908 (reference).

Depth 7⅕ to subcaudal origin; head 3¾, width 1⅘. Snout 2⅛ in head; eye 4¼, 2 in snout, 1⅘ in interorbital; mouth width 3⅕ in head, slightly curved, with deep straight groove and labial folds at each angle, upper fold half jaw length and lower shorter; teeth in 33 rows above, 30 below, upper little narrower, cusp triangular, roof shaped in cross section, erect near middle of mouth, more oblique laterally; lower teeth much inclined toward mouth angles, cutting edge nearly horizontal, deep notch on outer edge; nostrils slightly nearer snout tip than eye, internarial 3⅘ in preoral length, narrow valves with short angular lobe across middle of nostril and another smaller one short space farther inward; preoral length 1⅗ in head; interorbital 2½, low. Gill openings subequal, about ¾ of eye, before pectoral.

Scales pedicellate, with radiate base and 3 sharp, slender cusps at summit, each bearing keel on its outer side, fourth erect cusp frequently above peduncle.

First dorsal origin little nearer ventral origin than spiracle, fin length slightly less than head, fin height about ⅕ fin length; second dorsal begins behind ventral base, fin length 1½ in head, little higher than first dorsal; caudal equals head to third gill opening or 3½ in rest of body, subcaudal 2½ in caudal; least depth of caudal peduncle 5½ in head; pectoral 1¾ in head to first gill opening, width 1⅘ its length which reaches 1⅖ to first dorsal origin; ventral length 2⅒ in head.

Dark brown, little lighter below. Inside mouth, gill openings, nostrils and fin edges blackish. Length, 922 mm. (Garman.)

DEANIA EGLANTINA Jordan and Snyder

Deania eglantina JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 25, p. 80, fig. 2, 1902 (type locality: Totomi Bay, off Numazu).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 632, fig. 4, 1903 (type).

Acanthidium eglantina GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 221, 1913 (copied).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (type).

Acanthidium eglantinum PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 158, 1908 (Japan).

Centrophorus calceus (not Lowe) REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 51, 1908 (Japanese specimen).

Depth 8 to subcaudal origin; head 3, snout 2 in head; eye 3⅘, 2½ in snout, 2 in interorbital; mouth below hind part of eye, rather broad; lips moderately fleshy; teeth small, compressed, with small basal cusp; preoral length 1⅖ in head; nostrils about midway between snout tip and eye. Gill openings all before pectoral, first ½ of eye.

Scales each with short bristlelike spines or 2 small prickles on each side, rather velvety to touch.

First dorsal with very short tip of spine exposed, origin about midway between middle of snout and subcaudal origin, fin length about 2 in head; second dorsal origin midway between hind edge of first dorsal and subcaudal origin, spine 3⅖ in head, front fin edge 2⅛; caudal length 1⅛, subcaudal length 1⅘ in caudal length; pectoral 2¼ in head; ventral 3⅔.

Uniform gray brown. Length, 305 mm. (Jordan and Fowler.)

Japan.

Subgenus NASISQUALUS Smith and Radcliffe

DEANIA PROFUNDORUM (Smith and Radcliffe)

Nasisqualus profundorum SMITH and RADCLIFFE, Proc. U. S. Nat. Mus., vol. 41, p. 681, text fig. 3 (under view of head), pl. 53, 1912 (type locality: Between Leyte and Mindanao, 736 to 976 fathoms; between Marinduque and Luzon, 736 fathoms; off northern Mindanao, 410 fathoms; between Siquijor and Bohol, 392 fathoms).

Acanthidium profundorum GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 219, 1913 (Philippines).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (reference).—ROXAS and MARTIN, Dept. Agric. Comm. Manila, Tech. Bull. 6, p. 15, 1937 (reference).

Depth 5⅓ to subcaudal origin; head 3¼, width 1⅞. Snout 2⅕ in head; eye 3⅓, 1½ in snout, 1¾ in interorbital; mouth width 2⅞ in head, 1⅘ in preoral length, groove and labial fold well developed; skin at upper side of mouth angle smooth; preoral length 1⅗ in head; nostril width equals internarial, median in snout length; low interorbital 2½ in head. Gill slits subequal, last 3 closer. Spiracle half of internarial or little less than gill slits.

Skin rough velvety to touch; each scale as small trident of 3 slender subequal spines.

First dorsal inserted well behind pectoral base or at last third in depressed pectoral, fin length 1⅕ in head; second dorsal length 1⅓; caudal 3½ in rest of fish, subcaudal 2 in caudal length; least depth of caudal peduncle 6 in head; pectoral 1⅔, width 1½ in its length, reaches ⅙ in first dorsal length; ventral 2 in head.

Color in alcohol uniform dark brown, most of fins dark marginally. Iris gray black, pupil light or buff.

Philippines.

U.S.N.M. No. 70258. D. 5491. Lat. 9°24′ N., long. 125°12′ E., between Leyte and Mindanao. In 736 fathoms. August 1, 1909. Length 440 mm. Type of *Nasisqualus profundorum.*

D. 5219. Between Marinduque and Luzon. In 530 fathoms. April 23, 1908. Female. Length 440 mm. Paratype of same.

D. 5491. Between Leyte and Mindanao. In 736 fathoms. August 1, 1909. Female. Length 505 mm. Paratype of same.

D. 5495. Between Leyte and Mindanao. In 976 fathoms. August 1, 1909. Female. Length 590 mm. Paratype of same.

D. 5511. Off Camp Overton Light, northern Mindanao. In 410 fathoms. Length 210 and 335 mm. Two examples. Paratypes of same.

D. 5527. Between Siquijor and Bohol Islands. In 392 fathoms. August 11, 1909. Length 225 mm. Paratypes of same.

DEANIA NATALENSE (Gilchrist)

Acanthidium natalense GILCHRIST, Marine Biol. Surv. South Africa, Spec. Rep. No. 2, pt. 3, p. 49, pl. 7, fig. 2, 1922 (type locality: Natal coast in 160 fathoms).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 51, pl. 3, fig. 1, 1925 (compiled).

Depth 7½ to subcaudal origin; head 3⅙. Snout 2 in head; eye 4, 2 in snout; mouth wide, width 2¾ in preoral length, groove and labial folds well developed; skin at upper side of mouth angle plicated; preoral length 1⅖ in head; nostrils wide, width ½ distance apart, situated about halfway between snout end and eye, valves narrow; interorbital low. Gill openings subequal, last 2 closer, about ½ of eye. Spiracle large, length equals space from hind upper eye edge or about half of orbit.

First dorsal origin close behind pectoral base, fin length 1⅖ in head; second dorsal length 1⅔, origin well behind ventral base; caudal 2⅞ in rest of body, subcaudal 2¼ its length; least depth of caudal peduncle 6¾ in head; pectoral 1⁹⁄₁₀, width 1⅖ its length; which reaches ⅓ in first dorsal length; ventral 2⅔ in head.

Color not given, apparently uniformly dark. Length not given. (Gilchrist.)

Natal.

Genus ENTOXYCHIRUS Gill

Entoxychirus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, pp. 496, 498. (Type *Squalus uyato* Rafinesque, orthotypic.)

Entoxychyrus DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 699, 1865. (Type, *Squalus uyato* Rafinesque.)

Atractophorus GILCHRIST, Marine Biol. Surv. South Africa, Spec. Rep., No. 2, pt. 3, p. 48, 1922. (Type, *Atractophorus armatus* Gilchrist, monotypic.)

Body fusiform. Head depressed. Snout blunt. Eyes large, without nictitating membrane, orbits long and with angle at each end. Mouth wide, little arched, deep labial fold at each angle. Teeth unlike in 2 jaws, compressed; upper with triangular cusp, more erect; lower with inner or cutting edge directed outward. Nostrils slightly oblique. Gill openings moderate, before pectorals. Spiracles superior, rather large. Two dorsals, each with laterally longitudinally grooved spine, exposed at top; first dorsal near pectorals; second dorsal behind ventrals. Tail without pits; subcaudal separated by notch from terminal.

Small bathypelagic sharks.

Although Whitley lists *Entoxychirus uyatus* (Rafinesque) in Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934, "The record of this species from Australia may be referable to a *Squalus*".

ANALYSIS OF SPECIES

a^1. ENTOXYCHIRUS. Second dorsal spine not shaped as arrowhead terminally.
  b^1. Second dorsal larger than ventrals; orbit less than snout.
    c^1. Second dorsal high as first, fins subequal---------------------------- acus
    c^2. Second dorsal $\frac{3}{4}$ height of first, smaller------------------------ harrissoni
  b^2. Second dorsal smaller than ventrals, both smaller than first dorsal; orbit longer than snout--- atromarginatus
a^2. ATRACTOPHORUS. Second dorsal spine shaped as arrowhead terminally; orbit longer than snout; inner pectoral angle extends far back as first dorsal base-- armatus

Subgenus ENTOXYCHIRUS Gill

ENTOXYCHIRUS ACUS (Garman)

Centrophorus acus GARMAN, Bull. Mus. Comp. Zool., vol. 46, p. 204, 1906 (type locality: Japan).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 53, 1908 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 199, pl. 12, figs. 5–8, 1913 (Japan).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus,, Vertebrata, p. 189, 1920 (Misaki).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., p. 495, 1930 (reference).—TANAKA, Jap. Fish. Life Colours No. 27, 1933.

Depth 6 to subcaudal origin; head $4\frac{1}{8}$, width $1\frac{3}{5}$. Snout 3 in head; orbit $3\frac{1}{3}$, $1\frac{1}{10}$ in snout, $1\frac{2}{3}$ in interorbital; mouth width $2\frac{1}{2}$ in head, slightly curved, with deep straight groove and short labial fold at each angle; teeth in 36 rows above, 34 below, upper with triangular sharp cusps median erect and lateral oblique; lower with cusps little broader, from symphysis outward directed obliquely toward angles of mouth; nostrils about last third in snout, valves with sharp pointed lobes, internarial $2\frac{3}{4}$ in preoral length, which 2 in head; interorbital $2\frac{1}{5}$, rather low. Gill openings large, last largest or $\frac{2}{3}$ of orbit, before pectorals. Spiracle moderate, semilunate, width $\frac{3}{4}$ space to orbit or nearly $\frac{1}{3}$ of orbit.

Scales rough, each with strong median and 2 weaker lateral cusps on hinder edge extended from keels on crown; on white scales scattered over body keels appear more numerous and vanish before reaching hinder part of scale.

First dorsal origin behind pectoral base, or opposite upper or outer pectoral angle, long as head; second dorsal length $1\frac{1}{10}$, high as first dorsal, origin close behind hind basal ventral end; caudal $3\frac{1}{8}$ in rest of body, front subcaudal edge 2 in caudal length; least depth of caudal peduncle $4\frac{1}{10}$ in head; pectoral length $1\frac{1}{3}$, width $1\frac{7}{8}$ its length, inner angle reaches about opposite first third in first dorsal base; ventral length $1\frac{3}{4}$ in head.

Dark gray-brown, light below. Lighter in area behind orbit and another in middle of forehead. Length, 819 mm. (Garman.)

Japan.

ENTOXYCHIRUS HARRISSONI (McCulloch)

Centrophorus harrissoni McCulloch, Biol. Res. *Endeavour*, vol. 3, pt. 3, p. 99, pl. 14, figs. 1–4, 1915 (type locality: Near Gabo Island, Victoria).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (copied).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Depth 6½ to subcaudal origin; head 3¾, width 1⅗. Snout 2⅖ in head; orbit 3⅔, 1½ in snout, 2 in interorbital; mouth width 2⅓, slightly arched, with deep groove and short labial folds at each angle; oblique lateral groove extends behind vertical of spiracle, equals ⅔ or ¾ of mouth width; upper teeth much smaller than lower, near symphysis little oblique, others more oblique and somewhat larger toward sides, lateral cutting edge almost horizontal; lower teeth with cutting edge nearly horizontal, imperfectly serrated; nostrils slightly nearer orbit than snout tip, front nasal flap with triangular lobe and sometimes secondary lobule, hind nasal edge with narrow skinny lobe, internarial 2½ in preoral length, which 1⅞ in head; interorbital 2⅕, low. Gill openings become closer together posteriorly, last widest. Spiracle large, subtriangular, little behind and well above eye.

Scales small, sessile, pointed posteriorly, upper surface with several keels which converge towards point.

First dorsal origin well behind pectoral base, fin length 1½ in head; second dorsal length 1⅔, origin well behind ventral base, fin lower than first dorsal; caudal 3 in rest of body, front subcaudal edge 2⅖ in caudal length; least depth of caudal peduncle 6 in head; pectoral 1⅓, width 1⅞ its length, inner angle reaches about midway in first dorsal base; ventral length 2 in head.

Gray above, lighter beneath without darker markings. Length, 800 mm. (McCulloch.)

Victoria. Described from 3 females and 1 male, smallest 760 mm., a female selected as type.

ENTOXYCHIRUS ATROMARGINATUS (Garman)

Centrophorus atromarginatus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 200, pl. 13, figs. 1–4, 1913 (type locality: Suruga Gulf, Japan).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (reference).

Depth 6 to subcaudal origin; head 4, width 1¾. Snout 3⅖ in head; orbit 3, little greater than snout, about 1⅓ in interorbital; mouth width 2⅓ in head, little curved, with long straight groove and labial folds at each angle; teeth in 42 rows above, 30 rows below, upper of 8 or 10 longitudinal rows trifle smaller and nearly erect, from these becoming oblique; lower teeth larger and cutting edges more nearly horizontal; nostrils about last third in snout length, valve rounded lobe with basal lobule, internarial 2⅘ in preoral length, which 2 in head; interorbital 2⅕, rather low. Gill openings equidistant, last largest, about half orbit, before pectoral. Spiracle large, semilunate, above and behind eye distant about ⅗ eye diameter.

Scales with keels or striae converging towards apex, smooth and pavementlike on body, where worn.

First dorsal origin opposite upper or outer pectoral angle, well behind pectoral base, fin length equals head; second dorsal length 1⅛, origin close behind basal ventral edge, high as first dorsal; caudal 3 in rest of body, front subcaudal edge 2 in caudal length; least depth of caudal peduncle 4¼ in head; pectoral length 1⅓, width 1⅔ its length, inner angle reaches opposite first fourth in first dorsal base; ventral length 1⅔ in head.

Upper surfaces grayish-brown, thickly sprinkled with white scales. Whitish below. Pectorals, dorsals, and caudal edged blackish. Length, 857 mm. (Garman.)

Japan.

Subgenus ATRACTOPHORUS Gilchrist

ENTOXYCHIRUS ARMATUS (Gilchrist)

Atractophorus armatus GILCHRIST, Marine Biol. Surv. South Africa, Spec. Rep. No. 2, pt. 3, p. 48, pl. 7, fig. 3, 1922 (type locality: Natal coast in 160 fathoms).—BARNARD, Ann. South Afric. Mus., vol. 21, pt. 1, p. 52, pl. 3, fig. 2, 1925 (type).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 364, 1935 (Durban, Natal).

Depth 6⅓ to subcaudal origin; head 3⅗. Snout 3⅞ in head; orbit 2½, greater than snout; mouth width equals its distance from nostrils, angle with deep groove and short labial fold on each jaw about ⅕ mouth width; teeth unicuspid, with cutting edge horizontal except at symphysis of upper jaw, where single undeflected tooth; preoral length slightly less than half of head length; nostrils at end of first third in preoral length, internarial about equals preoral length; interorbital low, broad. Spiracle above and behind eye, distant from orbit half its distance from first gill opening.

Scales small, accuminate, with many sharp ridges.

First dorsal origin close behind pectoral base, fin length 1⅕ in head; second dorsal length 1⅘, origin close behind depressed ventral, spine barbed like an arrow head; least depth of caudal peduncle 5; caudal 2½ in rest of body, subcaudal front edge 2⅗ in caudal length; pectoral 1⅒ in head, width 1½ its length, inner angle slender and reaches opposite hind basal edge of first dorsal; ventral length 2⅕ in head.

Color not given, apparently uniform. Length, 355 mm. (Gilchrist.)

Natal.

Genus ETMOPTERUS Rafinesque

Etmopterus Rafinesque, Caratteri animali piante Sicilia, p. 14, 1810. (Type, *Squalus aculeatus* Rafinesque, monotypic.)

Spinax Cuvier, Règne animal, vol. 2, p. 129, 1817. (Type, *Squalus spinax* Linnaeus, tautotypic.)

Acanthidium Lowe, Proc. Zool. Soc. London, 1839, p. 91. (Type, *Acanthidium pusillum* Lowe, designated by Goode and Bean, Oceanic ichthyology, p. 10, 1895. Precludes *Acanthidium* Montrouzier, 1858, in Rhynchota.)

Acanthidim Sollas, Zool. Record, vol. 43, 1906, p. 58, 1907. (Type, *Acanthidium pusillum* Lowe.)

Body partly cylindrical or fusiform, longer than tail. Snout produced, blunt, wide. Eyes large, lateral, shielded by pigment in upper front of orbit, without nictitating membranes. Mouth transverse, moderately arched, long deep groove at each mouth angle. Teeth dissimilar in 2 jaws; upper erect, tricuspid, bladelike; lower very oblique, inner margin forming cutting edge. Nostrils well advanced, on lateral edge of snout. Gill openings narrow. Spiracle large, above and behind eye, superior. Scales small, with wide quadrangular or radiate bases and with or without an erect cusp. Often with luminous organs, very minute and numerous as lines and patches covering nearly entire ventral body surface. Dorsals with spines doubly grooved laterally, second longer than first, behind ventrals. No anal. Caudal short, without pit in front, with shallow notch between subterminal and subcaudal portions.

Bathypelagic. Like *Isistius* some of the species of interest as luminous.

ANALYSIS OF SPECIES

a^1. Acanthidium. Second dorsal origin behind ventral base; first dorsal origin midway between orbit and second dorsal origin.
  b^1. Ventrals inserted nearer pectoral origin than subcaudal origin.
    c^1. Caudal long as head to last gill opening; second dorsal inserted opposite hind basal ventral edge-- **lucifer**
    c^2. Caudal long as head to first gill opening; second dorsal inserted nearly or entirely behind ventral---------------------------------- **brachyurus**
  b^2. Ventrals inserted midway between pectoral and subcaudal origins or little nearer latter; second dorsal inserted close behind hind basal ventral edge. **pusillus**
a^2. Etmopterus. Second dorsal origin over or little before ventral base; ventral origin slightly nearer subcaudal than pectoral origin.
    d^1. First dorsal origin much nearer second dorsal origin than spiracle. **villosus**
    d^2. First dorsal origin much nearer spiracle than second dorsal origin. **spinax**

Subgenus ACANTHIDIUM Lowe

ETMOPTERUS LUCIFER Jordan and Snyder

Etmopterus lucifer Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 25, p. 79, 1902 (type locality: Misaki); Annot. Zool. Japon., vol. 3, p. 129, 1901 (KuroSiwo, off Misaki; no description).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 634, fig. 5, 1903 (type).—SMITH and RADCLIFFE, Proc. U. S. Nat. Mus., vol. 41, p. 679, 1912 (Mindanao Sea off north coast Mindanao; between Negros and Siquijor; Balayan Bay; Verde Island Passage; off eastern Mindoro; Malavatuan Island; off west Jolo; between Jolo and Tawi Tawi).—TANAKA, Fishes of Japan, vol. 8, p. 133, pl. 36, figs. 137–141, 1912 (Mochiyama in Sagami Sea, 300 fathoms).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Mororan).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 226, 1913 (Odawara).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 189, 1920 (Tateyama, Boshiu).—GILCHRIST, Marine Biol. Surv. South Africa, Spec. Rep. No. 2, pt. 3, p. 49, 1922 (Natal, in 150–250 fathoms).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (Philippines and Japan).—SCHMIDT, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 461, 1930 (note) ; Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 8, 1931 (Misaki).—TANAKA, Jap. Fish. Life Colours, No. 14, 1933.—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 15, 1937 (reference).

Spinax lucifer REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 45, 1908 (Japan).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 597, 1913 (Flores Sea).—NORMAN, *Discovery* Rep., vol. 12, p. 37, 1935 (lat. 34° 8′ S., long. 17° 33′ E., in 402?–548 m.).

Depth 8 to 9 to subcaudal origin; head 4¾ to 5, width 1¾ to 2. Snout 2⅘ to 3 in head, coriaceous, obtuse; eye 4 to 5⅓, 1¼ to 1⅘ in snout, 1¾ to 1⅘ in interorbital, orbit very large, depth about 1¼ to 1½ its length; dental width $2\frac{1}{10}$ to 2⅔ in head; teeth 28 rows above, 32 below, upper with median lanceolate cusp, 3 or 4 graduated inner cusps and 2 outer cusps of which outermost smaller; lower cutting edge nearly horizontal, cusps low as compressed terminal denticle to each tooth directed outward; nostrils anterior, sublateral and inferior, aperture width equals internarial, front valve small triangular point; interorbital 2½ to 2⅔ in head, depressed. Gill openings subequal in width with spiracles, last widest, before pectoral origin. Spiracles superior, eye diameter behind and level with upper part of eye.

Scales are small or minute simple denticles, arranged in longitudinal close-set series or rows on body above, flanks and over tail, scattered irregularly over black-pigmented lower surfaces. Along side of tail rows of scales most distinct.

First dorsal origin at first ⅖ in space between pectoral and ventral origins, spine subequal with eye, fin length 1⅘ to 2⅕ in head; second dorsal inserted nearer ventral origin than subcaudal, spine 2 to 2⅛ in head, fin length 1⅖ to 1¾; subcaudal front edge 1⅘ to 2, 2½ to 2⅗ in caudal length; least depth of caudal peduncle 6¾ to 7¾ in head; pectoral 1¾ to 1⅘, width 1⅕ to 1¼ its length; ventral 1⅖ to 1⅘ in head; each clasper bears 4 rather large, slender, terminal antrorse spines and extends beyond ventrals.

Back and sides rather dark brown, separated on flanks and side of tail by lighter brown longitudinal bands from blackish of belly and under surface of tail. On lower sides of tail from above ven-

trals black band or line extends forward below second dorsal. Lower black area of tail extends along close above subcaudal lobe short space. Fins all pale or dull brown. Caudal dark terminally. Iris slaty.

Natal, East Indies, Philippines, Japan. Known by its denticulate scales forming longitudinal ridges over the upper surface of the body. None of my material seems to show a condition of probably becoming "uniform black with age" as Garman suggests. Some specimens have the markings less contrasted, though this doubtless in a measure the result of preservation.

U.S.N.M. No. 50254. Misaki, Japan. Jordan and Snyder. Length, 290–340 mm 3 paratypes.

U.S.N.M. No. 50728. Misaki. Jordan and Snyder. Length, 285 mm.

U.S.N.M. No. 51282. Misaki. Jordan and Snyder. Length, 192–354 mm. 11 examples.

4520. D. 5111. Sombrero Island, S. 180° E., 6.75 miles (lat.13°48′22″ N., long. 120°47′25″ E.). Jan. 17, 1908. Length, 110 mm.

1652. D. 5122. Malabrigo Light, N. 14° W., 9 miles (lat. 13°27′20″ N., long. 121°17′45″ E.), east coast Mindoro. Feb. 2, 1908. Length, 218 mm.

2685. D. 5172. Jolo Light, E. 24.75 miles (lat. 6°03′15″ N., long. 120°35′30″ E.). March 5, 1908. Length, 256 mm.

2753. D. 5268. Matocot Point, E. 50° E., 5.80 miles (lat. 13°42′ N., long. 120° 57′15″ E.), Mindoro. June 8, 1908. Length, 128 mm.

10093. D. 5281. Malavatuan Island (N.), S. 84° W., 4.30 miles (lat. 13°52′45″ N., long. 120°25′ E.). July 18, 1908. Length, 210 mm.

2811. D. 5365. C. Santiago Light, S. 68° W., 5.4 miles (lat. 13°48′30″ N., long. 120°43′45″ E.), Balayan Bay, Luzon. Feb. 20, 1909. Length, 208 mm.

10174. D. 5501. Macabalan Point Light (Mindanao), S. 35° E., 8.2 miles (lat. 8°37′37″ N., long. 124°35′ E.). August 4, 1909. Length, 218 mm.

2448. D. 5504. Macabalan Point Light (Mindanao), S. 39° E., 6 miles (lat. 89°35′30″ N., long. 124°36″ E.). August 5, 1909. Length, 188 mm.

1387, 1388. D. 5505. Macabalan Point Light (Mindanao), S. 31° E., 7.7 miles (lat. 8°37′15″ N., long. 124°36′ E.). August 5, 1909. Length, 165 to 260 mm.

1720. D. 5506. Macabalan Point Light (Mindanao), S. 41° E., 12.2 miles (lat. 8°40′ N., long. 124°31′45″ E.). August 5, 1909. Length, 128 mm.

1 example. No data. Length, 117 mm.

ETMOPTERUS BRACHYURUS Smith and Radcliffe

Etmopterus brachyurus SMITH and RADCLIFFE, Proc. U. S. Nat. Mus., vol. 41, p. 679, text fig. 2 (under view of head), pl. 52, 1912 (type locality: Lat. 6°02′00″ N., long. 120°44′40″ E. in 263 fathoms, off Jolo).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 227, 1913 (Jolo).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (Philippines).—ROXAS and MARTIN, Dept. Agri. Comm. Manila, Tech. Bull. 6, p. 15, 1937 (reference).

Depth 7⅓ to origin of subcaudal lobe; head $4\frac{1}{10}$ measured to first gill opening, width 1⅗. Snout 3 in head to first gill opening; eye 4½, 1¼ in snout; preoral length 2⅙ in head to first gill opening; mouth width slightly greater than preoral length; upper teeth small, with 5 evenly graduated lanceolate cusps, lower larger, single oblique cusp to each; nostrils large, each 1¾ in internasal space, which 2¾ in preoral length; interorbital low, convex. Gill opening small, first largest or about ½ of eye. Spiracle rather large, or about half of eye, midway between snout tip and last gill opening.

Upper surfaces with distinct longitudinal keels over-lapping minute denticles of scales, most distinct on tail. Lower surfaces of body roughly denticulate, and without longitudinal keels. Lower side of head about mouth naked.

First dorsal inserted midway between middle of eye and second dorsal origin, length along front edge 2 in head measured to first gill opening, spine 2⅓ in front dorsal edge; second dorsal entirely posterior to ventral, length along front edge 1⅞ in head to first gill opening, spine 1¼ in length of front fin edge; caudal long as head, subcaudal 1¾ in its length; pectoral length 1⅘ in head to first gill opening; ventral 1¾, origin midway between first gill opening and subcaudal origin.

Light brown above, below dark brown. All fins yellowish brown.

Philippines, in deep water. Differs from *Etmopterus lucifer* in the broader head, shorter and more obtuse snout, wider mouth, and shorter and broader caudal fin.

U.S.N.M. No. 70257. Lat. 6°02′ N., long. 120°44′40″ E., off Jolo Light, Jolo, in 263 fathoms. September 17, 1909. Length, 227 mm. Type.

ETMOPTERUS PUSILLUS (Lowe)

Acanthidium pusillum LOWE, Proc. Zool. Soc. London, p. 91, 1839 (type locality: Madeira).

Spinax pusillus REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 144, 1908 (Misaki, to 343 fathoms).

Etmopterus pusillus TANAKA, Fishes of Japan, vol. 6, p. 88, pl. 22, figs. 84–88, 1912 (Misaki).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 228, 1913 (Madeira; Japan).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 189, 1920 (Misaki).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (Japan).—SCHMIDT, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 461, 1930 (luminosity); Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 9, fig. 1, 1931 (Misaki).

Spinax niger (not Bonaparte) GRAY, List fish British Mus., p. 71, 1851 (on Lowe).

Etmopterus frontimaculatus PIETSCHMANN, Anz. Akad. Wiss. Wien, vol. 44, p. 395, 1907 (type locality: Japan); Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 654, pl. 1, fig. 2, pl. 2, fig. 2, text figs. 1–2, 1908 (types).

Depth 7 to subcaudal origin; head 3⅘, width 1½. Snout 3¾ in head; orbit 3¾, 1 in snout, 1⅔ in interorbital; mouth width 1⅘ in head, only very slightly curved, deep groove and short labial folds on both jaws at angles; upper teeth erect, tricuspidate, about 24 rows; lower teeth oblique, points turned aside so inner margin forms cutting edge; nostrils about first third in snout, oblique, internarial 3⅓ in preoral length; interorbital 2¼ in head, convex. Hind gill openings smaller and closer, last before pectoral. Spiracle large, oval, about half orbital length above and behind eye.

Skin with fine spineless tubercles as scales, arranged irregularly, without longitudinal striae. Lateral line high, concurrent with back.

First dorsal inserted about opposite depressed pectoral tip, fin length 2¼ in head; second dorsal origin behind ventral base, fin length 1½ in head, spine 3; caudal 3⅔ in rest of body, front subcaudal edge 2 in caudal; least depth of caudal peduncle 8⅖ in head; pectoral 1⅞, width half its length; ventral length 1¾ in head.

Brownish-black, dark blackish lower side abruptly contrasted except beneath hind edge of second dorsal and in oblong space above ventral, where skin of lower side colored like back. Upper eyelid with crescentic milk-white border posteriorly. Triangular milk-white blotch on interorbital medially. Fins, except caudal, paler than body, outer portions whitish. Caudal brownish black, tip darker, broad paler transverse band before terminal dark part. Length, 201 mm. (Tanaka.)

Japan. Also in the Atlantic at the Madeira Islands. Garman says the scales are variable, diverse on different parts of the body, commonly with a broad tetragonal 4-pronged base under the skin and a small exposed quadrangular superstructure surrounded by a ridge with or without serrations or spinules and with hindmost angle produced in a depressed spine. In some cases the crown is concave, in others convex, in still others it forms a tubercle or short spine.

Subgenus ETMOPTERUS Rafinesque

ETMOPTERUS VILLOSUS Gilbert

Etmopterus villosus GILBERT, Bull. U. S. Fish. Comm., vol. 23, pt. 2 (1903) p. 580, pl. 66, 1905 (type locality: off south coast Molokai, in 222–498 fathoms).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 225, 1913 (type).—FOWLER, Mem. Bishop Mus., vol. 10, p. 23, 1928 (type); Proc. 4th (1929) Pacific Sci. Congr. Java, p. 496, 1930 (type).

Spinax granulosus (part) REGAN, Ann, Mag. Nat. Hist., ser. 8, vol. 2, p. 44, 1908 (note).

Depth 6⅓ to subcaudal lobe origin; head 3⅗, width 1½. Snout 3⅖ in head, pliable, depressed, length half its width; eye 5¼ in head, 1¾ in snout, orbital slit 1⅕ in interorbital; dentary width 2 in head, labial fold deep at upper jaw angle, its length but little less than horizontal orbital slit; teeth above in 27 rows, 29 rows below, tricuspid with median cusp longest; nostrils large, ⅔ horizontal orbital slit, internasal ⅓ mouth width; interorbital broadly convex. Gill openings ⅓ of eye. Spiracle large, transverse, superior behind eye, width ½ of pupil.

Skin with small hispid asperities, each as simple little point, on tail form longitudinal rows which narrow to 10 along least depth of caudal peduncle. Fins naked, hispid points extend only over basal areas broadly; small smooth areas behind dorsals, ventrals, and pectorals; lips, spiracles, nostrils, and gills also naked.

First dorsal length 1¾ in head, inserted little nearer snout tip than upper caudal origin, spine 1⅔ in second dorsal spine which slightly greater than interorbital; second dorsal length 1⅓ in head, longer than first dorsal; caudal 3½ in rest of body; subcaudal lobe longer than second dorsal; pectoral 2 in head, broad basal length ⅔ fin length; ventral 1⅘ in head, small, base extending little posterior to second dorsal origin.

Dark brown, belly slightly darker than upper surface. Dorsals dull blackish basally, broadly whitish terminally. Other fins dark basally and paler terminally. Iris neutral dusky, pupil pale brownish. Gill opening blackish.

Hawaiian Islands. Only known from the type, described above.

U.S.N.M. No. 52583. Off south coast of Molokai, in 222–498 mm. *Albatross* collection. Length, 170 mm. Type.

ETMOPTERUS SPINAX (Linnaeus)

Squalus spinax LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 233, 1758 (type locality: Europe).

Etmopterus spinax BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 49, 1925 (off Cape Point, in 417 fathoms).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 80, fig. 27, 1936 (Italy).

Spinax spinax NORMAN, *Discovery* Rep., vol. 12, p. 37, 1935 (lat. 34° 8′ S., long. 17° 33′ E., in 402?–548 m.).

Depth 6½ to 9⅘?; head 5 to 5⅚. Snout 2⅞ to 3⅛ in head; iris 3 to 5, orbit long as snout in profile; mouth length ⅓ its width, front edge of upper jaw about last third in eye; groove outside each mouth corner forms deep pit or socket; upper teeth erect, quincuspid, median cusp longest, slender; lower teeth all directed laterally, outer edge with single deep notch; nostrils lateral on snout below, equal internasal, placed at first fourth of preoral; each with 2 short, obsolete fleshy points. Last gill opening before pectoral base, first largest, or ⅓ of interorbital. Spiracle little elevated from eye and distant space ⅓ of interorbital, length 4⅛ in same.

Scales setiform, velvety to touch, finer on fins.

First dorsal origin trifle nearer second than snout tip; spine about half front fin edge, upper ⅗ exposed; fin smaller than second. Origin of second dorsal about midway between first and end of last caudal vertebra or over hind basal portion of ventral; spine well compressed, ¾ front edge of fin. Lower caudal lobe little before upper. Pectoral short, falls well before dorsal. Ventral inserted midway between tip of lower jaw and caudal tip.

Upper surface brown, lower surface darker to blackish.

Eastern Atlantic, Mediterranean, South Africa.

A.N.S.P. Nos. 480–482. Italy. Length, to 416 mm.

Genus CENTROSCYLLIUM Müller and Henle

Centroscyllium Müller and Henle, Syst. Beschr. Plagiostomen, p. 191, 1841. (Type, *Spinax fabricii* Reinhardt, monotypic.)

Paracentroscyllium Alcock, Ann. Mag. Nat. Hist., ser. 6, vol. 4, p. 379, 1889. (Type, *Paracentroscyllium ornatum* Alcock, monotypic.)

Body elongate, fusiform. Tail shorter than body cavity. Head wide. Snout short, blunt, depressed. Eye large, orbit elongate, no nictitating membrane. Mouth wide, moderately arched, with deep groove and labial fold at each angle. Teeth small, raptorial, with 3 to 7 sharp cusps. Gill openings narrow, before pectoral. Spiracle behind eye higher, superior. Scales small, usually with wide base and slender acuminate cusp. Dorsal spines well exposed, grooved longitudinally each side; first dorsal near pectorals; second dorsal behind ventrals. No anal. Caudal without pits, subcaudal deep, lobe little produced.

Small dark or black sharks, mostly of deep seas.

ANALYSIS OF SPECIES

a^1. Centroscyllium. Caudal truncated posteriorly, lower edge of fin with distinct posterior notch; second dorsal origin before hind basal ventral edge.
  b^1. First dorsal origin close behind pectoral base, before pectoral tip; black, fin edges with white borders________________________________ nigrum
  b^2. First dorsal origin opposite depressed pectoral tip; fins broadly whitish terminally____ ritteri
a^2. Paracentroscyllium. Caudal ends in point posteriorly, lower edge of fin without distinct posterior notch; black________________________ ornatum

Subgenus Centroscyllium Müller and Henle

CENTROSCYLLIUM NIGRUM Garman

Centroscyllium nigrum Garman, Mem. Mus. Comp. Zool., vol. 24, p. 28, pl. 1, fig. 2, pls. 4–5 (anatomy), pl. 69, fig. 1, 1899 [type locality: Lat. 7° to 6° N., long. 81° W., in 546 555 fathoms, off Galapagos].—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 41, 1908 (compiled).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 231, 1913 (type).—Fowler, Mem. Bishop Mus., vol. 10, p. 23, 1928 (type of *Centroscyllium ruscosum*); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (same material).

Centroscyllium ruscosum Gilbert, Bull. U. S. Fish Comm., vol. 23, pt. 2 (1903) p. 580, fig. 230, 1905 (type locality: Near Kauai, in 418–429 fathoms).

Depth 5⅓ to subcaudal origin; head 3⅓, width 1⅓. Snout 3⅛ in head, soft, pliable, depressed; eye 4½, 1⅓ in snout, 2 in interorbital; dentary width 2 in head, short labial fold around angle;

teeth in 40 rows above, 44 rows below, tricuspid, median cusp largest; nostrils large, 2/3 horizontal eye diameter, internarial space 2 in mouth; interorbital broad, depressed. Gill openings half of eye. Spiracle superior, close behind eye, 2½ in eye.

Body largely smooth, only scattered small, inconspicuous sparse short filaments visible with lens.

First dorsal length 1⅗ in head, fin inserted well behind pectoral base, spine 1⅔ in second dorsal spine; second dorsal length 1⅗ in head, spine 1¼ in interorbital; caudal length 3 in rest of body; subcaudal lobe nearly large as second dorsal, not hollowed out as shown in Gilbert's figure; pectoral 1¾ in head, not foreshortened as in Gilbert's figure; ventral 1½, moderate, base entirely before second dorsal base.

Dark brown, lower half or more of body darker, thus belly much darker than back. Sides and back, also top of head with variable pale blotches, due to torn areas in thin skin. Fins all bordered broadly with whitish. Iris slaty. Lower surface of body especially with dusky to blackish brown dots, distinct under a lens, also showing less so and sparsely over back.

Galapagos and Hawaiian groups in deep water.

Gilbert's *Centroscyllium ruscosum* was founded on the type, described above, and a paratype 400 mm. long, an adult male. Its scales are said to be rather distinct fine prickles on small stellate bases. Many of teeth with 4 or 5 cusps. Claspers reaching over halfway to subcaudal origin, each with pair of lateral slender hooked subterminal spines, between which median soft prolongation tapering to point and bearing terminal prolongation of groove. White margin of fins narrower than in the type, a feature in agreement with Garman's original figure of *Centroscyllium nigrum*.

U.S.N.M. No. 51585. Near Kauai, in 418–429 fathoms. *Albatross* collection. Length, 215 mm. Type of *Centroscyllium ruscosum*.

CENTROSCYLLIUM RITTERI Jordan and Fowler

Centroscyllium ritteri JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 635, fig. 6, 1903 (type locality: Misaki).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 232, 1913 (Misaki).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 189, 1920 (Misaki).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 496, 1930 (Japan).

Centroscyllium fabricii (not Reinhardt) REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 40, 1908 (note).

Depth 6⅔ to subcaudal origin; head 4⅙. Snout 3⅓ in head; orbit 3⅓, about equals snout; preoral length 2 in head, about equals mouth width and labial fold at each mouth corner; teeth tricuspid, alike in both jaws; nostrils large, inferior, midway in snout; interorbital 2, greater than space between spiracles. Gill openings equidistant, last before pectoral. Spiracle large, superior, behind eye.

Scales as small, single, scattered prickles, not on preoral, small on lower abdominal surface.

First dorsal inserted opposite hind depressed pectoral end, fin length 1⅓ in head; second dorsal origin opposite first fourth in ventral, spine 1⅔ in head, fin length 1¼; caudal 3 in rest of body, front subcaudal edge 2 in caudal length; least depth of caudal peduncle 4¾ in head; pectoral 1⅞, width 1⅕ its length; ventral length 1⅗ in head.

Uniform dark gray-brown, blackish below. In front fins all more or less broadly whitish. Length, 406 mm. (Jordan and Fowler.)

Japan. The type in Stanford University.

Subgenus PARACENTROSCYLLIUM Alcock

CENTROSCYLLIUM ORNATUM (Alcock)

Paracentroscyllium ornatum ALCOCK, Ann. Mag. Nat. Hist., ser. 6, vol. 4, p. 379, 1889 (type locality: Swatch of No-ground, in Bay of Bengal, 405–485 fathoms).

Centroscyllium ornatum ALCOCK, Journ. Asiatic Soc. Bengal, vol. 65, pp. 308, 310, 1896 (Arabian Sea, 620–690 fathoms); Cat. deep-sea fishes, Indian Mus., p. 14, 1899 (Bengal Bay; Arabian Sea); Illustr. Zool. *Investigator*, pt. 7, pl. 35, fig. 1a-b, 1900.—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 41, 1908 (type).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 233, 1913 (Bengal Bay and Arabian Sea, 285–690 fathoms).

Depth 7¾ to subcaudal origin; head 3⅞, width 1⅕. Snout in profile 3⅛ in head; orbit 3⅔, slightly greater than snout, 1⅞ in interorbital; mouth crescentic, large, width equals or slightly exceeds preoral length, which 2 in head; teeth minute and tricuspid in both jaws; nostrils large, on ventral surface of edge of snout about last ⅖ its length; interorbital 2 in head in profile, flat, depressed. Gill openings subequal, slightly over half of orbit, gradually closer to last, which before pectoral base. Spiracle rather small, about ⅓ of orbit, behind and about ½ orbital diameter above.

Scales minute, extremely deciduous, each with stelliform base.

First dorsal origin opposite hind depressed pectoral edge, spine 1¼ in orbit, fin length 1½ in head; second dorsal origin opposite hind basal ventral edge, spine 2⅕ in head, fin length 1⅗; caudal 2⅘ in rest of body, front subcaudal edge 2 in caudal length; least depth of caudal peduncle 4⅘ in head; pectoral 1⅞; ventral 1⅗.

Uniform jet black, integument very deciduous. In young deep violet black, lighter between eyes. Head with minute white spots arranged in shape of lute. Ventral tips pale. Length, 173 mm. (Alcock.)

Arabian Sea, Bengal Bay, to 690 fathoms.

Genus SQUALUS Linnaeus

Squalus LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 233, 1758. (Type, *Squalus acanthias* Linnaeus, designated by Gill, Ann. Lyceum Nat. Hist. New York, vol. 8, p. 39, 1861.)

Squallus SCOPOLI, Introd. Nat. Hist., p. 464, 1777. (Type, *Squalus acanthias* Linnaeus.)

Acanthorhinus BLAINVILLE, Bull. Soc. Philomath. Paris, p. 121, 1816. (Type, *Squalus acanthias* Linnaeus, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 95, 1917.)

Acanthias RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 131, 1826. (Type, *Acanthias vulgaris* Risso=*Squalus acanthias* Linnaeus, tautotypic.)

Carcharias (not Rafinesque) GISTEL, Naturg. Thierreichs, p. VIII, 1848. (Type, *Squalus acanthias* Linnaeus, virtually. *Carcharias* Gistel proposed to replace *Acanthias* Risso.)

Centrophorides DAVIS, Trans. Roy. Dublin Soc., ser. 2, vol. 3, p. 478, 1887. (Type, *Centrophorides latidens* Davis.)

Cirrhigaleus TANAKA, Fishes of Japan, vol. 9, p. 151, 1912. (Type, *Cirrhigaleus barbifer* Tanaka, monotypic.)

Phaenopogon HERRE, Copeia, 1935, No. 3, p. 123, fig. 1. (Type, *Phaenopogon barbulifer* Herre, orthotypic.)

Body elongate, partly round, longer than tail. Head flattened below. Snout produced, tapering. Orbit lateral, elongate. Mouth wide, little arched, with deep groove and with labial folds at each angle. Teeth compressed, sectorial, alike in 2 jaws, with oblique cusp and with cutting edge nearly parallel to jaw edge. Nostrils transverse, inferior, remote from mouth. Gill openings before pectoral. Spiracles behind and elevated from eye. Each dorsal with spine in front, which not grooved on sides, first dorsal near pectoral and second behind ventrals. Caudal with produced subcaudal, without notch below terminal portion. Pit at root of caudal.

The dogfishes, spur dogs, or piked dogfishes are a cosmopolitan group and may be said to occur in all cool seas. Though Garman admits but three species, quite likely a number of others are valid. Roving far and wide in shoals, they feed variously on marine invertebrates and fishes, and are very voracious. Also especially destructive to the great schools of cod and herring, at times appearing in equally great numbers. The females are said to approach the shore in the spring and each give birth to about ten young.

I include the following four nominal species though I have been unable to examine any materials:

SQUALUS GRIFFINI Phillipps

Squalus griffini PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 12, No. 6, p. 360, 1931 (type locality: "Trawled in Hauraki Gulf").

Distance from snout to pectoral origin just over 5 in total length. Labial folds 5, run obliquely outward from below angles of jaws. Teeth of upper jaw smaller than lower, points deflected outward and upward. Rounded central lobe at base of each tooth and smaller lobe in front of each deflected point. These double basal lobes quite noticeable in teeth of both upper and lower jaws. First gill opening much more oval than others; second, third, and fourth approximately equal, and fifth larger.

First dorsal originates just behind inner pectoral margin. Spines of dorsals with polished appearance, rounded on sides and not flattened laterally. Ventral origin nearer caudal tip than snout. Space from hind ventral edge to lower caudal lobe equals length of upper caudal lobe.

No sign of spots.

Length, 31.75 mm. (Phillipps).

New Zealand. Differs from *Squalus megalops*, a nominal Australian species, in the heavy, compressed, unpolished second dorsal spine, somewhat shorter head, and more backward ventral fin.

SQUALUS KIRKI Phillipps

Squalus kirki PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 12, No. 6, p. 361, 1931 (on Phillipps, 1929).

? *Squalus acanthias* (not Linnaeus) RENDAHL, Vidensk. Medd. Dansk. naturh. Forenh. Kjöbenhavn, vol. 81, p. 1, 1925 (Akaroa Harbor, New Zealand).

Squalus fernandinus (not Molina) PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 10, p. 223, 1928 (type locality: New Zealand).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Middle of ventral base posterior to midway between end of snout and end of upper caudal lobe (in *Squalus megalops* middle of ventral base exactly midway between snout end and end of upper caudal lobe). Reaches 3 feet 6 inches.

SQUALUS TASMANIENSIS Rivero

Squalus tasmaniensis RIVERO, Occas. Pap. Boston Soc. Nat. Hist., vol. 8, p. 267, pl. 10, figs. a–e, 1936 (type locality: Hobart Town, Tasmania).

Depth 8⅖ in length to subcaudal origin; head 5⅕ measured to first gill opening, width 1¾. Snout 2⅓ in head to first gill opening; eye 8⅘, 3¾ in snout, 4 in interorbital; mouth width 3 in head to first gill opening; preoral length 2¼; mouth with short deep groove and labial fold at each angle; teeth with cutting edges on both jaws; upper teeth narrower, with 1 median tooth, its cusp median, erect, pointed, with 2 lateral lobes; lower teeth broader and more parallel to jaw, 2 rows in use and in both rows upper median tooth clearly visible; nostrils transverse, halfway between mouth and snout tip, anterior valve broadly rounded with rudimentary extension on its hinder edge. Gill openings little less than half length of orbit, all in front of pectorals.

Scales formed by thin median ridge, curved backwards and ending posteriorly by blunt point, its anterior angle rounded, its upper margin almost parallel to body, alike on all parts of body. These scales somewhat resemble a claw, but not curved or pointed.

Brown with hinder angles of dorsal, ventrals, hind margin of pectorals and ventral surface whitish. No spots evident on any part of body.

Length, 247 mm. (Rivero.)

Tasmania. Said to differ from *Squalus acanthias* in the long orbit, long snout, dermal denticles, median upper teeth and coloration. Said to differ from other species in the median upper teeth and pattern of the dermal denticles.

SQUALUS WHITLEYI Phillipps

Squalus whitleyi PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 12, No. 6, p. 361, 1931 (on McCoy, Prodr. Zool. Victoria, vol. 1, dec. 8, pl. 75, 1886, type locality: Hobson's Bay).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Noticed by Phillipps: "For the species without labial folds described by McCoy I propose the name *Squalus whitleyi*."

ANALYSIS OF SPECIES

a^1. SQUALUS. Nostrils without barbel.
  b^1. First dorsal inserted well behind pectoral base, over or behind depressed pectoral; nasal valve not distinctly bilobate.
    c^1. First dorsal spine behind and remote from inner pectoral angle. acanthias
    c^2. First dorsal spine opposite or little behind inner pectoral angle. suckleyi
  b^2. First dorsal inserted close behind pectoral base, well before inner pectoral angle; nasal valve distinctly bilobed---------------------- fernandinus
a^2. CIRRHIGALEUS. Each nostril with barbel long as eye; first dorsal origin over inner pectoral angle-- barbifer

Subgenus SQUALUS Linnaeus

SQUALUS ACANTHIAS Linnaeus

Squalus acanthias LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 233, 1758 (type locality: European Ocean); ed. 12, vol. 1, p. 397, 1766.—BONNATERRE, Tableau Encyclop. Ichth., p. 11, pl. 5, fig. 11, 1788 (Atlantic).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1500, 1789 (omni mari).—WALBAUM, Artedi Pisc., vol. 3, p. 505, 1792 (copied).—FORSTER, Fauna Indica, p. 13, 1795.—BLUMENBACH, Handb. Naturg., p. 257, 1799.—SCHNEIDER, Syst. Ichth. Bloch, p. 135, 1801 (omni mari).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 192, pl. 14, figs. 1–4, pl. 43, figs. 9–10, pl. 59, figs. 1–2, 1913 (France and New England).—THOMPSON, Marine Biol. Rep. South Africa, No. 2, p. 149, 1914.—NORMAN, *Discovery* Rep., vol. 12, p. 37, 1935 (lat. 33° 53′ S., long. 17° 38′ E., in 310 m.).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 69, figs. 19–20, 1936 (middle Atlantic States).

Acanthias vulgaris GRAY, List fish British Museum, p. 70, 1851 (Cape Seas).—BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 21, pp. 50, 58, 79, 1860 (Cape of Good Hope).—GUICHENOT, Notes ile Réunion, vol. 2, p. 30, 1863.—

Schmeltz, Cat. Mus. Godeffroy, No. 4, p. 28, 1869 (South Africa).—Günther, Cat. Fishes British Mus., vol. 8, p. 418, 1870 (Cape of Good Hope).—Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 219, 1872 (compiled).—Schmeltz, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Cape of Good Hope).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 511, 1891 (reference).

Depth 6½ to 8⅗ to subcaudal origin; head 4⅘ to 5¼, width 1½ to 1⅔. Snout 2⅖ to 2⅗ in head; orbit 4⅔ to 5, 2 to 2½ in snout, 3¼ to 3½ in interorbital; mouth width 2, slightly arched, with short deep groove and labial folds at each angle; upper teeth narrower and little more inclined than lower; nostrils nearly midway or at last ⅖ in snout, front valve short, longer and with sharp outer angle, oblique, internarial 2¾ in preoral length which 1⅗ to 1⅔ in head; interorbital 2½ to 2⅔, widely convex. Fifth gill reaches opposite first dorsal in male, little shorter in female; ventral length 1½ to 1⅗ in head; claspers reach below middle of second dorsal.

Slate gray to brown above. Sometimes 2 rows of white spots on each flank, variable in shape and number, usually pair near front of each dorsal and another behind and lower rows often much elongate. Lower surface whitish. Fins with pale edges in young.

South Africa. Also in Atlantic. Described from Atlantic material. Length to 915 mm.

SQUALUS SUCKLEYI (Girard)

Spinax (*Acanthias*) *suckleyi* Girard, Proc. Acad. Nat. Sci. Philadelphia, p. 196, 1854 (type locality: Fort Steilacoom, Puget Sound).

Squalus sucklii Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 40, 1901 (reference).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 46, 1908 (Pacific coast of North America south to California).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 194, 1913 (northeast and northwest Pacific).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (Formosa, Japan, Hawaii, British Columbia, California).

Squalus suckleyi Mori. Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Jinsen, Korea).—Fowler, Mem. Bishop Mus., vol. 10, p. 23, 1928 (Pearl Harbor, Honolulu, Maui); Hong Kong Nat., vol. 1, p. 88, 1930 (China); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 246, fig. 14, 1932 (Chefoo).

Squalus suckli Tanaka, Jap. Fish. Life Colours, No. 22, 1933.

Acanthias vulgaris (not Risso) Müller and Henle, Syst. Beschr. Plagiostomen, p. 83, 1841 ("Sudee").—Schlegel, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 305, pl. 135, 1850 (Bay of Nagasaki).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 21, 1853 (Nagasaki); (Japan), vol. 26, p. 44, 1857 (Japan).—Günther, Cat. Fishes British Mus., vol. 8, p. 418, 1870 (Cape of Good Hope; not Australia).—Nyström, Bih. Kon. Svensk. Vet. Akad. Handl. Stockholm, vol. 13, No. 4, p. 50, 1887 (Nagasaki).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 61, 1897.

Squalus mitsukurii Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 129, 1901 (Misaki; no description).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 629, fig. 3, 1903 (type locality: Misaki and Aomori).—Snyder, Bull.

U. S. Fish Comm., vol. 22 (1902), p. 515, 1904 (Honolulu, off Maui, 267–283 fathoms).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), p. 45, fig. 6, 1905 (Kailua).—GILBERT, Bull. U. S. Fish Comm., vol. 23 (1903), p. 580, 1905 (off Maui, in 267–283 fathoms).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 47, 1908 (China, Japan, Hawaii).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Mororan, Tomakomai, Misaki).—TANAKA, Fishes of Japan, vol. 26, p. 471, pl. 130, figs. 368–370, 1917 (Watanoka, Province Rikuzen).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, No. 3, p. 3, 1928 (Fusan, Korea).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 248, fig. 15, 1932 (Chefoo).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 95, 1933 (Chusan; Ningpo; Chanhai; Siapu; Haimen; Wenchow; Yenting).

Squalus sucklii subsp. *mitsukurii* SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 7, 1931 (Fusan; Nagasaki).

Acanthias mitsukurii GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 490, 1910 (Japan and Hawaii).

Squalus japonicus ISHIKAWA, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 71 (type locality: Tokyo market, Kagoshima).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 188, 1920 (Tokyo market).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).

Squalus wakiyae TANAKA, Fishes of Japan, vol. 27, p. 475, 1918 (on Jordan and Fowler).

Squalus acanthias (not Linnaeus) SOLDATOV and LINDBERG, Bull. Pac. Sci. Fisher. Inst., vol. 5, p. 16, 1930 (Far East Seas).

Depth 7 to 7¾ to subcaudal origin; head 4⅛ to 4⅖, width 1⅖ to 1⅔. Snout 2½ to 2⅔ in head; orbit 3⅔ to 4, 1⅗ to 1¾ in snout, 1⅔ to 2 in interorbital; mouth width 2⅕ to 2⅓ in head, deep groove at each angle, upper labial fold little longer than lower; teeth subequal, inclined laterally, upper little narrower; nostrils at last ⅖ or ⅓ of snout, front valve with short lobe scarcely divided, internarial 2⅕ to 2¼ in preoral length, which 1¾ to 1⅞ in head; interorbital 2⅛ to 2⅔, little elevated, flattened medially. Last gill openings closer, before pectoral. Spiracle about size of pupil close above and behind orbit.

Scales minute, pedunculate, on back some tricarinate.

First dorsal origin over inner hind pectoral edge, fin length 1⅗ to 1¾ in head; second dorsal origin over or behind ventral ends, fin length 1⅔ to 1⅘ in head; caudal 3½ to 4 in rest of body, front subcaudal edge 2 in caudal length; least depth of caudal peduncle 6⅔ to 7½ in head; pectoral 1⅖ to 1⅞, width 1¼ to 1⅖ its length, reaching first dorsal origin to ⅖ in fin base; ventral length 2 to 2⅓ in head.

Gray above, white beneath. Variably with 1 or 2 pale longitudinal bands on front part of side, merging with whitish of lower surface posteriorly. Sometimes scattered whitish spots in 2 rows on front part of body or extending posteriorly. Lobes of fins all more or less blackish, hind angles or edges pale to whitish.

China, Formosa, Korea, Japan, Hawaii. Also in the Eastern Pacific in British Columbia, Washington, Oregon, and California.

U.S.N.M. No. 37755. Korea. J. B. Bernadon.
U.S.N.M. No. 55443. Honolulu. *Albatross* collection.
U.S.N.M. No. 55728. Hilo, Bureau of Fisheries.
U.S.N.M. No. 62450. Honolulu. *Albatross* collection.
U.S.N.M. No. 62461. Honolulu. *Albatross* collection.
U.S.N.M. No. 62464. Honolulu. *Albatross* collection.
U.S.N.M. Nos. 62467 and 62468. Honolulu. *Albatross* collection.
U.S.N.M. No. 71312. Mororan, Japan. *Albatross* collection 1906.
U.S.N.M. No. 71834. Tomakomai, Japan. *Albatross* collection 1906.
U.S.N.M. No. 71835. Misaki, Japan. *Albatross* collection 1906.

SQUALUS FERNANDINUS Molina

Squalus fernandinus Molina, Saggio Stor. Nat. Chili, p. 229, 1782 (type locality: Chile).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 46, 1908 (Tasmania; New Zealand).—Waite, Rec. Canterbury Mus., vol. 1, No. 2, p. 12, pl. 16, fig. 1, 1909 (New Zealand, 9–105 fathoms).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 195, 1913 (Juan Fernandez).—Waite and McCulloch, Trans. Roy. Soc. Australia, vol. 39, p. 460, 1915 (Great Australian Bight, 88–94 fathoms).—Waite, Rec. South Austral. Mus., vol. 2, No. 1, p. 23, fig. 30, 1921.—Gilchrist, Marine Biol. Surv. South Africa, Spec. Rep. No. 2, pt. 3, p. 48, 1922 (off Natal in deep water).—Herre, Philippine Journ. Sci., vol. 23, p. 73, 1923 (Dumaguete).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 191 (Natal); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 495, 1930 (Chile and Indian Ocean).—Herre, Journ. Pan-Pac. Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 12, 1934 (Dumaguete).—Fowler, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 71, 1936 (Italy).—Roxas and Martin, Dept. Agric. Comm. Manila, Techn. Bull. 6, p. 14, 1937 (reference).

Squalus fernandezianus Norman, *Discovery* Rep., vol. 16, p. 10, 1937 (Juan Fernandez).

Squalus acanthus (part) Lacépède, Hist. Nat. Poiss., vol. 1, p. 272, pl. 10, fig. 2, 1798.

Acanthias blainvillii Gray, List fish British Mus., p. 70, 1851 (type locality: Cape Seas).—Günther, Cat. fishes British Mus., vol. 8, p. 419, 1870 (Cape of Good Hope; New Holland).——Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 3, p. 1096, 1888 (deep water off Port Jackson).

Acanthias blainvillei Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 21, pp. 50, 58, 80, 1860 (Cape of Good Hope).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 367, 1881 ("New Holland" on Günther).—Sauvage Hist. Nat. Madagascar, Poiss., p. 511, 1891 (reference).

Acanthias vulgaris (not Risso) Gray, List fish British Mus., p. 70, 1851 (New Holland).—Hector, Colonial Mus. Governm. Surv. Dept. Fishes New Zealand, p. 76, 1872.—Klunzinger, Arch. Naturg., vol. 38, p. 47, 1872 (Hobsons Bay); Sitz. Ber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, pt. 1, p. 428, 1880 (Australia).—McCoy, Prodromus Zool. Victoria, dec. 8, pl. 75, 1883.—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 11, 1888 (Port Jackson).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 44, 1890 (reference).—Ishakawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 51, 1897.

Acanthias megalops Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 367, 1881 (type locality: Port Jackson).—Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 4, p. 185, 1889 (Port Jackson).

Squalus megalops Waite, Rec. Australian Mus., vol. 4, p. 33, pl. 4, fig. 2, 1901 (fetus); Mem. New South Wales Nat. Club, No. 2, p. 8, 1904.—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 47, 1908 (South Australia; Tasmania).—McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 9, 1911 (off Babel and Flinders Island in Bass Strait); Fishes of New South Wales, ed. 2, p. 9, pl. 2, fig. 25a, 1927.—Phillipps, New Zealand Journ. Sci. Techn., vol. 10, p. 223, 1928 (waters north).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 194, pl. 27, fig. c, 1934 (Victoria), p. 199 (reference).

Squalus acutipinnis Regan, Ann. Natal Gov. Mus., vol. 1, p. 248, pl. 37, 1908 (type locality: Table Bay, Cape of Good Hope, Natal, Mauritius); Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 47, 1908 (type, South Africa; Mauritius).—Clark, Rep. Sci. Res. *Scotia*, Scot. Nat. Antarct. Exped., vol. 4, p. 395, 1915 (Houtjes Bay and off Salamander Point; entrance to Saldanha Bay).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, p. 284, 1916 (references).—Norman, *Discovery* Rep., vol. 12, p. 37, 1935 (lat. 34° S., long. 17° 58′ E., in 173–210 m.; lat. 33° 48′ S., long., 17° 30′ E., in 329 m.)

Squalus philippinus (not Shaw) Smith and Radcliffe, Proc. U. S. Nat. Mus., vol. 41, p. 677, fig. 1, pl. 51, 1912 (type locality: lat. 13° 45′ 15″ N., long. 120° 46′ 30″ E., off Sombrero Island, west coast Luzon, in 236 fathoms).

Squalus brevirostris Tanaka, Fishes of Japan, vol. 26, p. 464, pl. 129, figs. 362–363, pl. 130, fig. 364, 1917 (type locality: Tokyo market, probably Shimonoseki).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 250, fig. 16, 1932 (Chefoo).

Squalus montalbani Whitley, Australian Zool., vol. 6, p. 310, 1931 (on *Squalus philippinus* Smith and Radcliffe, not Shaw, 1804).

Depth 5⅞ to 6⅔ to subcaudal origin; head 3¾ to 4¾, width 1½ to 1⅗. Snout 3⅛ to 3¼ in head; orbit 3 to 3¼, subequal with snout, 1½ to 1⅗ in interorbital; mouth width 2⅛ to 2⅔ in head. slightly arched, with deep groove at each angle long as upper labial fold, lower much shorter; teeth subequal in jaws, directed laterally, with inner edges forming cutting edges; nostrils nearly midway to last third in snout, front valve distinctly bilobed, internarial 2⅕ to 2⅖ in preoral length, which 1⅘ to 2 in head. Gill openings little less than orbit, last little closer, before pectoral. Spiracle rather small, less than pupil, close behind eye superiorly.

Scales minute, tridentate, with median denticle longest, laterals half as long, all on flat base.

First dorsal origin close behind pectoral base, fin length 1½ in head; second dorsal origin well behind depressed ventral tips, fin length 1⅘ in head; caudal 3 to 3⅔ in rest of body, front subcaudal edge 2 in caudal length; least depth of caudal peduncle 7⅓ to 7⅖ in head; pectoral 1⅙ to 1⅗, width 1⅓ its length which extends ¾ in first dorsal base; ventral length 1½ to 1¾ in head.

Above dark grayish, below paler. Dorsals blackish terminally, paler basally. Caudal blackish medianly, lobes pale yellowish gray.

South Africa, Natal, Mauritius, Philippines, Japan, Korea, New

South Wales, Victoria, Tasmania, South Australia, New Zealand. Also in the Eastern Pacific at Chile.

U.S.N.M. No. 70256. Station 5111, lat. 13°45′15″ N., long. 120°46′30″ E., off Sombrero Island, West coast Luzon, in 236 fathoms. *Albatross* collection. Length, 325 mm. Type of *Squalus philippinus*.

Subgenus CIRRHIGALEUS Tanaka

SQUALUS BARBIFER (Tanaka)

Cirrhigaleus barbifer TANAKA, Fishes of Japan, vol. 9, p. 151, pl. 41, figs. 156–162, 1912 (type locality: Tokyo market, Japan).

Squalus (*Cirrhigaleus*) *barbifer* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 457, 1913 (Japan).

Phaenopogon barbulifer HERRE, Copeia, No. 3, p. 123, fig. 1, 1935 (type locality: Japan).

Depth 5¾ to subcaudal origin; head 5⅛, width 1⅓. Snout 3⅕ in head; orbit 4¼, 1⅛ in snout, 1⅞ in interorbital; mouth width 1⅖ in head, little arched, upper labial fold half way to symphysis of upper jaw or ½ groove extending back from each mouth angle; teeth in 26 rows in each jaw, subequal, directed obliquely; nostrils nearer eye than snout tip, about midway in preoral length, each with barbel long as snout in profile; internarial 1⅘ in preoral length which 2 in head; interorbital 2¼, low. Gill openings equidistant, gradually large to last which ⅘ of orbit, before pectoral base. Spiracle above and close behind eye, about ⅖ of orbit.

Scales small, with prominent median keel and less elevated lateral ridges; little larger on nuchal region, on under surfaces flat, heart-shaped, almost without ridges.

First dorsal origin opposite hind inner pectoral angle, fin length 1⅛ in head; second dorsal origin behind hind basal ventral edge, fin length 1¼ in head; caudal 3⅗ in rest of body, front subcaudal edge 2 in caudal length; least depth of caudal peduncle 5½ in head; pectoral 1¼, width 1⅖ its length; ventral length 1¼ in head, clasper extending but little behind, short, thick.

Color not given. Length, 855 mm. (Tanaka.)

Genus OXYNOTUS Rafinesque

Oxynotus RAFINESQUE, Indice d'ittiologia siciliana, pp. 45, 60, 1810. (Type, *Squalus centrina* Linnaeus, monotypic.)

Centrina CUVIER, Règne animal, vol. 2, p. 130, 1817. (Type, *Squalus centrina* Linnaeus, tautotypic.)

Body stout and subtriangular medianly, slender and compressed in tail. Head small, depressed, flattened somewhat at crown. Snout obtuse, wide. Eye without nictitating folds. Mouth transverse, with labial folds and grooves, also lip. Teeth unlike in 2 jaws; upper slender, in narrow group; lower compressed, triangular, serrated, functional in single series, except perhaps when about to be shed.

Gill openings narrow. Spiracle rather large, behind eye. Scales uniform, rough. Two dorsals with deeply imbedded spines and anterior spine rising obliquely forward. No anal.

OXYNOTUS BRUNIENSIS (Ogilby)

Centrina bruniensis (Morton) OGILBY, Rec. Australian Mus., vol. 2, p. 62, 1893 (type locality: Brunny Island, Tasmania).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 42, 1908 (note).

Oxynotus bruniensis WAITE, Rec. Canterbury Mus., vol. 1, No. 1, p. 8, 1907 (reference).—MCCULLOCH, Zool. Res. *Endeavour*, vol. 2, p. 80, pl. 13, 1909–1910 (East Bass Strait and Great Australian Bight, in 80–220 fathoms).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 191, 1913 (Tasmania).—WAITE, Rec. South Australian Mus., vol. 2, p. 24, fig. 32, 1921.—MCCULLOCH, Biol. Res. *Endeavour*, vol. 5, pt. 4, p. 157, 1926 (off Gabo Island, Victoria).—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 10, p. 222, fig. 2, 1928 (New Zealand).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr. Java, p. 495, 1930 (reference).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 199, 1934 (reference).

Centrina salviana (not Risso) HUTTON, Trans. New Zealand Inst., vol. 22, p. 276, 1890.

Depth 3¼ to subcaudal origin; head 4⅕. Snout 2⅗ in head; orbit 4$\frac{1}{10}$, 1½ in snout; mouth small, transverse, lateral grooves broad and deep; upper jaws with patch of small, conic, curved teeth of about 4 irregular series; lower teeth uniserial, larger than upper, erect, compressed, minutely serrated, scalpriform; nostril about first ⅖ in snout; preoral length 2$\frac{1}{10}$; interorbital moderately high. Gill openings small, about ⅓ of orbit, equidistant, before pectoral. Spiracle about equals gill openings, above and distant from hind eye edge about its own diameter.

Scales rough, with central spine giving 4 compressed radiating wings, each ending in shorter spine.

First dorsal origin over third gill opening, fin height from hind basal edge equals head, base length little greater than head to last gill opening; interdorsal space 1⅖ in head to first gill opening; front edge of second dorsal 1; caudal 2½ in rest of body, front subcaudal edge 1⅘ in caudal length; least depth of caudal peduncle 3⅘ in head; pectoral 1$\frac{1}{10}$, width 2 in its length which not quite reaching opposite hind basal edge of first dorsal; ventral origin opposite last third in second dorsal base, fin length 1¾ in head.

Uniform sandy brown. Length, 600 mm. (Garman; McCulloch.)

Victoria, Tasmania, South Australia.

Family DALATIIDAE

Body partly fusiform, cavity more than half total length. Snout subconic. Eyes without nictitating membranes. Mouth transverse, little arched, with long deep straight oblique groove each side.

Teeth unlike in two jaws, upper raptorial, lower sectorial. Gill openings moderate to narrow, entirely before pectoral. Spiracles small, present. Scales uniform. Dorsals two, small, spine absent or rudimentary. No anal. Tail short, without lateral folds or caudal pits.

Mostly small sharks, differing from the Squalidae chiefly in the absence of fin spines. Many are widely distributed and the Arctic *Somniosus* reaches a large size. Most are viviparous.

ANALYSIS OF GENERA

*a*¹. Dalatiinae. Dermal armature fine or moderate shagreen, without scattered tubercles; snout subconcave; teeth unlike in 2 jaws.
*b*¹. Head subconic.
*c*¹. Second dorsal much longer than first ---------------- **Euprotomicrus**
*c*². Second dorsal nearly equals first.
*d*¹. Second dorsal nearer pectorals ---------------------------- **Dalatias**
*d*². Second dorsal nearer ventrals ----------------------------- **Isistius**
*b*². Head depressed; eyes small; first dorsal small, behind pectorals.
*e*¹. Second dorsal smaller than first ---------------- **Heteroscymnus**
*e*². Second dorsal larger than first.
*f*¹. Teeth in both jaws entire ------------------- **Heteroscymnoides**
*f*². Upper teeth entire; lower teeth serrated -------- **Pseudoscymnus**
*e*³. Second dorsal equals first ---------------------------- **Somniosus**
*a*². Echinorhininae. Skin with scattered tubercles or bucklers; snout broad, tapering; teeth alike in 2 jaws ------------------------- **Echinorhinus**

Genus EUPROTOMICRUS Gill

Euprotomicrus Gill, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 264. (Type, *Scymnus* (*Laemargus*) *labordii* Müller and Henle, monotypic.)

Squaliolus Smith and Radcliffe, Proc. U. S. Nat. Mus., vol. 41, p. 683, 1912. (Type, *Squaliolus laticaudus* Smith and Radcliffe, monotypic.)

Body elongate, fusiform. Head subconic. Snout short, subconic. Eyes without nictitating folds. Mouth with deep straight groove at each angle. Upper teeth small, subulate; lower large, compressed, smooth edged, with sharp and somewhat oblique cutting edges. Nostrils near snout end. Gill openings narrow, before pectorals. Spiracles rather wide, behind eye. Scales uniform, minute, flattened. First dorsal small, without or with small spine, behind pectorals and second dorsal much longer, without spine. No anal. Caudal short and deep.

Indo-Pacific.

ANALYSIS OF SPECIES

*a*¹. Dorsal insertion median ------------------------------------ **bispinatus**
*a*². Dorsal insertion premedian --------------------------------- **laticaudus**

EUPROTOMICRUS BISPINATUS (Quay and Gaimard)

Scymnus bispinatus Quoy and Gaimard, Voy. *Uranie*, Zool., p. 197, pl. 44, figs. 1–2, 1824 (type locality: Mauritius).

Dalatias (Somniosus) bispinatus GRAY, List fish British Mus., p. 77, 1851 (reference).

Euprotomicrus bispinatus REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 56, 1908 (Indo-Pacific).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 235, 1913 (Indian Ocean, Mauritius, New Zealand).—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 10, p. 224, fig. 5, 1928 (note).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (New Zealand).

Scymnus mauritianus QUOY and GAIMARD, Dict. Class. Hist. Nat., Atlas, vol. 11, pl. 114, fig. 2, 1830 (Mauritius); vol. 27, pl. 114, fig. 2, 1831.

Scymnus (Laemargus) labordii MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 94, 1841 (type locality: Mauritius; Bourbon).

Scymnus labordii WAITE, Rec. Canterbury Mus., vol. 1, p. 8, 1907.

Laemargus labordii DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 457, 1865 (Mauritius).

Euprotomicrus labordii GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 428, 1870 (no locality).—BOULENGER, Rep. Coll. *Southern Cross*, p. 174, 1902 (Campbell Island).

Euprotomicrus labordei SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 511, 1891 (reference).

Euprotomicrus hyalinus R. S. EIGENMANN, Proc. California Acad. Sci., ser. 2, vol. 3, p. 35, 1891 (type locality: Between Honolulu and San Francisco).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 235, 1913 (copied).

Depth 6¾ to subcaudal origin; head 4¼, width 1⅔. Snout 3 in head; orbit 4⅗, 1⅖ in snout, 1⅘ in interorbital; mouth width 2⅗ in head, slightly arched, deep groove at each angle; lower teeth 23, curved, sharp, upper smaller and narrower; nostril about first ⅖ in snout, oblique, valves broad, without point; internarial equals nostril or nearly 6 in preoral length, which 1⁹⁄₁₀ in head; interorbital 2⅘, moderately high, convex. Gill openings small, first largest and about equals pupil, others gradually smaller and last before pectoral origin. Spiracle large as pupil, about ⅔ orbital length behind and opposite upper eye edge.

Scales small, quadrate, crown depressed medially.

First dorsal inserted midway between snout tip and caudal base, very small or long as orbit; second dorsal begins behind hind basal ventral edge, fin length 1⅖ in head; caudal 5⅕ in rest of body, subcaudal 1¼ in caudal length or 1⅗ in head; least depth of caudal peduncle nearly 3 in eye; pectoral 1⅔ in head, length 2⅓ its width, reaches half way to first dorsal; ventral 1⅗ in head.

Brown. Iris yellow. Dorsals and ventrals pale. Pectoral basally blackish, broadly whitish terminally. Caudal dark brown largely, hind edge of upper lobe moderately and subcaudal terminally broadly pale to whitish. Length, 168 mm. (Quoy and Gaimard.)

Mauritius, Bourbon, Campbell Island, New Zealand. Also in the eastern Pacific as *Euprotomicrus hyalinus*.

EUPROTOMICRUS LATICAUDUS (Smith and Radcliffe)

Squaliolus laticaudus SMITH and RADCLIFFE, Proc. U. S. Nat. Mus., vol. 41, p. 684, text fig. 4 (under view of head), pl. 54, 1912 (type locality: Lat. 13° 42′ N., long. 120° 57′ 15″ E., Batangas Bay, Luzon).

Euprotomicrus laticaudus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 235, 1913 (Luzon).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 15, 1937 (reference).

Depth 6½ to subcaudal origin; head 3⅘, width 2½. Snout 2⅞ in head; orbit 5, 1½ in snout, 1¾ in interorbital; mouth width 4 in head, transversely straight, with deep groove back from each angle ⅘ mouth width; nostril slightly before middle in snout length, equals internarial, valves rounded; interorbital 3 in head, well convex. Gill openings small, last 3 closer. Spiracle equals internarial, half orbital length behind and above eye.

Scales small, quadrate, each with depressed median crown.

First dorsal inserted little nearer second dorsal origin than snout tip, equals preoral length; second dorsal begins over hind basal ventral edge, fin 2 3/7 in head; caudal 5⅓ in rest of fish, subcaudal 1⅖ in caudal or 2 in head; least depth of caudal peduncle 2⅕ in orbit; pectoral 2⅔ in head, width 1⅓ its length, reaches half way in first dorsal base; ventral 2 in head.

Color in alcohol dark brownish black. First dorsal brown basally, white marginally. Second dorsal white. Caudal brown basally, whitish marginally. Pectoral black basally, also small blotch terminally, otherwise white. Ventral rays and disklike terminal expansions white.

Philippines. One of the smallest of sharks.

U.S.N.M. No. 70259. D. 5268. Lat. 13°42′ N., long. 120°57′15″ E., in Batangas Bay, Luzon. In 170 fathoms. July 8, 1908. Length, 150 mm. Type of *Squaliolus laticaudus*.

U.S.N.M. D. 5297. Same locality as above. July 24, 1909. Length 115 mm. Apparently female, as ventral without modified terminal disks as in type. Paratype of *Squaliolus laticaudus*.

Genus DALATIAS Rafinesque

Dalatias RAFINESQUE, Caratteri animali Sicilia, p. 10, 1810. (Type, *Dalatias sparophagus* Rafinesque=*Squalus licha* Bonnaterre, designated by Jordan, Tanaka, Snyder, Journ. College Sci. Tokyo, vol. 33, p. 22, 1913.)

Dalatius AGASSIZ, Nomencl. Zool., Pisc., p. 21, 1845. (Type, *Dalatias sparophagus* Rafinesque.)

Scymnus (not Kugelmann 1914) CUVIER, Règne animal, vol. 2, p. 130, 1817. (Type, *Squalus americanus* Gmelin, monotypic.)

Scymnorhinus BONAPARTE, Cat. Metod. Pesci Europei, p. 16, 1846. (Type, *Squalus licha* Bonnaterre.)

Borborodes GISTEL, Naturg. Thierreichs, p. x, 1848. (Type, *Squalus licha* Bonnaterre, virtually. *Borborodes* Gistel proposed to replace *Scymnorhinus* Bonaparte.)

Body elongate, fusiform, cavity 3/5 of total. Tail shorter than body. Snout subconic, end obtusely rounded. Eye large, without nictitating folds. Mouth transverse, with deep straight groove and labial folds at each angle. Villous upper lip before teeth. Upper teeth raptorial, lanceolate; lower sectorial, compressed, serrated on edge, nearly erect in middle of mouth. Nostrils advanced, valve with rounded lobe in inner half. Gill openings narrow, small. Spiracles wide, transverse, behind eye and little higher, open upward. Scales minute, carinate. Dorsals short, without spine, first before ventrals. No anal. Caudal large, subcaudal deep.

Jordan and Evermann designated the type of *Dalatias* Rafinesque as *Dalatias nocturnus* Rafinesque = ? *Centrophorus granulosus* Schneider[5] as formally restricted by Swainson.[6] This is useless as Jordan, Tanaka, and Snyder had already (1913) given a formal type designation.

DALATIAS LICHA (Bonnaterre)

Squalus licha Bonnaterre, Tableau Encyclop. Ichth., p. 12, 1788 (on *La Liche* Broussonet, Mém. Acad. Sci. Paris, p. 677, 1780, type locality: "Le Cap Breton" in southern France).

Scymnus (*Scymnus*) *lichia* Müller and Henle, Syst. Beschr. Plagiostomen, p. 92, 1841 (Nice, Atlantic, Cape Breton, Bayonne).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 452, 1865 (Mediterranean).

Scymnus lichia Günther, Cat. Fishes British Mus., vol. 8, p. 425, 1870 (Mediterranean, Nice, Madeira).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 61, 1897.

Dalatias lichia Gray, List. fish British Mus., p. 75, 1851 (Madeira).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 188, 1920 (Misaki).

Dalatias licha Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 637, 1903 (Tokyo Museum).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (Atlantic).

Scymnorhinus lichia Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 54, 1908 (Japan).

Squalus americanus Gmelin, Syst. Nat. Linn., vol. 1, p. 1503, 1789 (on Broussonet).—Walbaum, Artedi Pisc., vol. 3, p. 521, 1792 (copied).—Lacépède, Hist. Nat. Poiss., vol. 1, p. 279, pl. 10, fig. 3, 1798 (Cape Breton).—Schneider, Syst. Ichth. Bloch, p. 136, 1801 (copied).

Dalatias americanus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 129, 1901 (Misaki; Suruga).

Squalus nicaeensis Risso, Ichth. Nice, p. 43, pl. 6, fig. 6, 1810 (type locality: Nice).

Dalatias sparophagus Rafinesque, Caratteri animali piante Sicilia, p. 10, pl. 13, fig. 2, 1810 (type locality: Sicily).

Depth 7¼ to 10¾; head 4⅘ to 5¼, width 1⅗. Snout 4 to 4⅗ in head; eye 5¾ to 6⅔, 1⅓ to 1½ in snout, 1⅔ to 1⅞ in interorbital; mouth width 2⅗ to 3 in head, with deep straight groove, both jaws with long labial folds; teeth in 18 or 19 irregular rows above, 19 rows below, upper lanceolate and narrowly pointed, lower wider and sectorial, with wide serrated triangular sectorial cusps; nostrils little nearer snout end than eye, valve obtuse point on inner edge, internarial 6⅓ to 7½ in head; interorbital 3 to 3⅔, broadly depressed or slightly concave medially. Gill openings small, last 2 closer together, before pectoral base.

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[5] Genera of Fishes, pt. 1, p. 77, 1917.

[6] Nat. Hist. Animals, vol. 1, p. 141, 1838.

Scales minute, as simple denticles, bicarinate, with keels joined at apex of denticles or sometimes each scale with single keel.

First dorsal origin close behind depressed pectoral tip, length 1⅓ to 1⅖ in head; second dorsal origin opposite last fifth in ventral base, fin length 1⅖ to 1⅗ in head; caudal length 3 in rest of body, front subcaudal edge 2⅕ to 2¼ in caudal length; least depth of caudal peduncle 5 to 6½ in head; pectoral 1¼ to 1⅗, width 2⅛ to 2½ in its length; ventral length 1 to 1⅖ in head.

Nearly uniform cinnamon-brown, fins all slightly darker. Iris slate or grayish.

Japan. Also in the Atlantic and Mediterranean.

A.N.S.P. Nos. 478, 479. Italy. C. L. Bonaparte. (No. 240.) Dr. T. B. Wilson.

DALATIAS PHILLIPPSI (Whitley)

Scymnorhinus phillippsi WHITLEY, Australian Zoologist, vol. 6, p. 310, 1931 (on McCulloch).

Scymnus lichia (not Bonnaterre) PARKER, Trans. New Zealand Inst., vol. 15, p. 223, pls. 31–32, 1883.

Scymnorhinus licha WAITE, Trans. New Zealand Inst., vol. 46, 1913, p. 128, pl. 4, fig. 1, 1914.—MCCULLOCH, Biol. Res. *Endeavour*, vol. 2, pt. 3, 1914, p. 81, pl. 14, text fig. 1, 1914 (mouth, teeth, scales) (Great Australian Bight, 160–200 fathoms).—WAITE, Rec. South Australian Mus., vol. 2, p. 24, fig. 33, 1921.—PHILLIPPS, New Zealand Journ. Sci. Techn., vol. 10, p. 224, fig. 4, 1928 (specimen Dominion Museum).

This nominal species does not seem to be satisfactorily defined. Phillipps says "which, as McCulloch hinted, is obviously not conspecific with the *Squalus licha* Bonnaterre."

DALATIAS BREVIPINNIS (J. L. B. Smith)

Scymnorhinus brevipinnis J. L. B. SMITH, Trans. Roy. Soc. South Africa, vol. 24, p. 1, text figs. 1–2, 1936 (type locality: Approximately 35 miles south of Cape Recife, about lat. 34° 32′ S., long. 25° 42′ E., in 110–150 fathoms).

Depth 7½ to origin of subcaudal lobe; head 5 to first gill opening. Snout 5 in head to first gill opening; eye 7½ to 8½, 1⅓ in snout; orbit 4 in head to first gill opening; mouth transverse, close behind hind edge of eye, with straight longitudinal groove from each angle; lower lip thick, no labial folds; upper teeth in 19 series, narrow, pointed, central tooth almost vertical, remainder oblique, edges entire, second row close behind first and behind these 3 more rows in succession; 19 compressed triangular teeth, central (anterior) tooth erect, remainder oblique, increasingly so posteriorly, edges serrate, 19 to 26 fine serrae on each edge, and behind single row of functioning teeth 4 overlapping rows of inwardly depressed teeth in succession; inner internasal space 1⅙ in preoral length; nostrils more or less rounded, separated, without serrae or oronasal grooves. Gill openings equal longitudinal diameter of eye. Spiracles large.

Head and body covered with small scales, each more or less quadrate, with dorsal ridge ending in a stout spine, usually also 1 or 2 minute basal spines.

First dorsal inserted midway between hind eye edge and second dorsal origin, length along front edge 1⅘ in head to first gill opening; second dorsal inserted over last fourth of ventral base, length along front edge 1⅔ in head to first gill opening; caudal from subcaudal origin 3¾ in rest of fish, front edge of subcaudal 2½ in caudal; least depth of caudal peduncle 4⅕ in head to first gill opening; pectoral 1⅕, width 2½ in its length; ventral length 1¼ in head.

Uniform dark brown, slightly lighter below. Tips of fins slightly lighter.

Length, 770–1,100 mm. (J. L. B. Smith.)

South Africa. Differs from *Dalatias licha* according to Smith "in numerous dimensional relationships, notably in the smaller fins, the caudal lobes being markedly lower . . . the teeth of the lower jaw in *licha* are oblique in juveniles but erect in adults. In my specimens of *brevipinnis*, of which the larger are presumably adults, all but the central symphyseal erect tooth of the lower jaw are oblique, the posterior teeth very markedly so."

Genus ISISTIUS Gill

Isistius Gill, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 264. (Type, *Scymnus brasiliensis* Quoy and Gaimard, monotypic.)

Leius Kner, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 24, p. 9, 1865. (Type, *Leius ferox* Kner, monotypic.)

Body elongate, fusiform, cavity ⅔ total length. Tail short. Head subconic. Eye large, without nictitating folds. Mouth transverse, with straight deep groove, covering labial folds, at each angle, ending at end of transverse fold in front of and covering distinct upper lip. Upper teeth raptorial, slender, subconic; lower sectorial, compressed, with smooth-edged, triangular cusp erect. Nostrils anterior, nasal valve short lobe in middle. Gill openings narrow. Spiracles transverse. Scales minute, polygonal or quadrangular, with central depression on crown, in pavement. Dorsals and paired fins small. Caudal short. Tail without lateral folds or caudal pits.

Pelagic in tropical and temperate seas. One species, of interest as one of the first sharks noticed to be luminous.

ISISTIUS BRASILIENSIS (Quoy and Gaimard)

Scymnus brasiliensis (Cuvier) QUOY and GAIMARD, Voy. *Uranie*, Zool., p. 198, 1824 (type locality: Brazil).

Scymnus (*Scymnus*) *brasiliensis* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 92, 1841 (Mauritius, St. Jago, Rio Janeiro).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 453, 1865 (types of *Scymnus unicolor* and *Scymnus torquatus*).

Dalatias brasiliensis GRAY, List fish British Museum, p. 76, 1851 (reference).

Isistius brasiliensis GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 429, 1870 (South Pacific, Gulf of Guinea).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 853, 1876 (lat. 14° S., long. 118° E., in Indian Ocean).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 511, 1891 (reference).—WAITE, Rec. Austral. Mus., vol. 3, p. 195, text figs. 1–2, 1900 (teeth) (Lord Howe Island); vol. 5, p. 141, 1904 (Lord Howe Island).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 55, 1908 (tropical and subtropical seas).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 238, 1913 (tropical and temperate seas).—FOWLER and BALL, Bishop Mus. Bull. 26, p. 5, 1925 (note).—WHITLEY, Journ. Pan Pacific Inst., vol. 2, No. 1, p. 3, 1927 (Fiji).—FOWLER, Mem. Bishop Mus., vol. 10, p. 23, 1928 (Honolulu); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (Hawaii); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).

Isistius braziliensis MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 368, 1881 ("Australia" on Kner).

Squalus fulgens F. D. BENNETT, Narr. Whaling Voy., vol. 2, p. 255, 1840 (type locality: Lat. 2½° S., long 163° W.; lat. 55° N., long 110° W.).—G. BENNETT, Gatherings Nat. Australasia, p. 66, 1860 (copied).

Scymnus torquatus (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 93, 1841 (no locality).

Scymnus unicolor (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 93, 1841 (type locality: Mauritius).

Leius ferox KNER, Denkschr. Akad. Wiss. Wien, Math.-nat. Kl., vol. 24, p. 10, pl. 4, figs. 2–2a, 1865 (type locality: Australia).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Apristurus spongiceps (not Gilbert) JORDAN and JORDAN, Mem. Carnegie Mus., vol. 10, p. 3, 1922 (cast of Honolulu specimen).

Echinorhinus brucus (not Bonnaterre) FOWLER, Occ. Pap. Bishop Mus., vol. 8, No. 7, p. 375, 1923 (Honolulu).

Body longer than tail, slender, tapering behind. Snout short, obtuse, tapers little from eye, depressed above, length 3/5 its width; eye large, long as snout in profile, pupil rounded; mouth wide, transverse, width greater than snout length and deep labial folds around angles; teeth in 20 rows in jaws, narrow upper ones more slender, broadly lower triangular, erect, entire, not notched; nostrils nearly at first third in snout; interorbital and head above depressed, surface convex. Gill openings small, before and all little above pectoral origin, last half width of first. Spiracles large, deep, transverse, length 2/3 of eye and about 4/5 eye diameter behind eye.

Skin with small, simple scales, close set in pavement.

Dorsals and ventrals behind middle in total length; dorsals small, rounded, first above and little before ventral origin; second dorsal well behind ventral, not reaching caudal; caudal 5½ in rest of body, with slight notch in upper lobe behind, subcaudal forming distinct lobe; pectoral short, partly truncate, angles rounded; ventral larger than dorsals.

Color dull vinaceous brown above, paler below. Dark color of back extends as band completely encircling gill openings and same region of pharynx. Fins colored dark like back, except pectoral which pale greenish on under surfaces and hind portions above, also borders of most of other fins. Iris dusky, large pupil green.

Mauritius, Australia, Lord Howe Island, Hawaii. Also in the tropical Atlantic.

"When the larger specimen, taken at night, was removed into a dark apartment, it afforded a very extraordinary spectacle. The entire inferior surface of the body and head emitted a vivid and greenish phosphorescent gleam, imparting to the creature, by its own light, a truly ghastly and terrific appearance. The luminous effect was constant, and not perceptibly increased by agitation or friction. I thought, at one time, that it shone brighter when the fish struggled, but I was not satisfied that such was the fact. When the shark expired (which was not until it had been out of the water more than three hours) the luminous appearance faded entirely from the abdomen, and more gradually from other parts; lingering the longest around the jaws and on the fins.

"The only part of the under surface of the animal which was free from luminosity was the black collar around the throat; and while the inferior surface of the pectoral, anal, and caudal fins shone with splendour, their upper surface (including the upper lobe of the tail fin) was in darkness, as also were the dorsal fins, back and summit of the head.

"I am inclined to believe that the luminous power of this shark resides in a peculiar secretion from the skin. It was my first impression, that the fish had accidentally contracted some phosphorescent matter from the sea, or from the net in which it was captured; but the most rigid investigation did not confirm this suspicion; while the uniformity with which the luminous gleam occupied certain portions of the body and fins, its permanence during life, and decline and cessation upon the approach and occurence of death, did not leave a doubt in my mind that it was a vital principle, essential to the economy of the animal." (Bennett.)

Since the above was written it has been found that the luminous condition continued some hours after death.

1 example. A.N.S.P. Honolulu, Hawaiian Islands. Bishop Museum. Length, 317 mm.

Genus HETEROSCYMNUS Tanaka

Heteroscymnus TANAKA, Fishes of Japan, vol. 6, p. 102, 1912. (Type, *Heteroscymnus longus* Tanaka, monotypic.)

Body elongated, somewhat compressed, body cavity ⅔ total length. Tail short. Head depressed. Snout pointed. Eyes small, without nictitating membrane. Mouth nearly transverse, with deep groove at each angle. Teeth unlike in two jaws, upper lanceolate and numerous, lower larger, compressed with oblique triangular cusp. Nostrils near snout end. Gill openings moderate, before pectoral. Spiracle small, behind and elevated from eye. Scales minute. Fins rather small. Dorsals spineless, first above postpectoral space. No anal. Caudal short, deep, without pits.

Japan.

HETEROSCYMNUS LONGUS Tanaka

Heteroscymnus longus TANAKA, Fishes of Japan, vol. 6, p. 102, pl. 26, figs. 102–107, 1912 (type locality: Tokyo market, Japan).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 239, 1913 (Sagami Sea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).

Depth to subcaudal 4⅞; head 5¼, width 1⅖. Snout 2¾ in head, obtuse as seen above; eye 8, 3 in snout, 4½ in interorbital; mouth width 2¼ in head, little arched, with groove from angle backward little less than ⅓ to gill opening; similar but very short groove on upper lip; lips thin; upper teeth lanceolate, sharp, irregular, close set, in several rows, of which 4 visible from outside and 20 in row visible from outside; lower teeth much larger, triangular, directed somewhat outward, without serration in margin, arranged in 2 rows, about 15 in row visible from outside, actual number 18; preoral length 2⅓ in head; interorbital 1⁹⁄₁₀, convex. Gill openings subequal, last before pectoral base, largest about twice eye. Spiracle small, oval, behind eye, interspiracle space 2⅖ in head.

Scales minute, finely shagreened, none enlarged. Short and rather indistinct ridge below lateral line on caudal peduncle.

First dorsal origin slightly nearer snout tip than subcaudal origin, front fin edge 1⅖ in head; second dorsal origin close behind ventral base, front fin edge 2⅓ in head; least depth of caudal peduncle 4 in head; caudal length from subcaudal origin 3⅓ in rest of body, subcaudal 1⅗ in caudal length; pectoral 1¼ in head, width 1⅞ its length; ventral length 1⅔ in head.

Blackish brown, edges of all fins darker. Length, 1,360 mm. (Tanaka.)

Japan.

Genus HETEROSCYMNOIDES Fowler

Heteroscymnoides Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 239, 1934. (Type, *Heteroscymnoides marleyi* Fowler, orthotypic.)

Body elongate, slender. Head long. Snout depressed. Eye large, little nearer gill opening than snout tip, without nictitating membrane. Mouth transverse, little arched, with deep groove back and upward from each corner. Teeth erect, pointed above, lower directed more obliquely and outward. Gill openings 5, subequal, small, before pectoral. Spiracle large, higher, and well behind eye. Scales small, simple, triangular plate ending in sharp point behind and with keeled median ridge above. First dorsal begins close behind pectoral origin. Second dorsal long, low, begins over middle of ventrals. Caudal broad. Pectoral without inner free lobe. Coloration black.

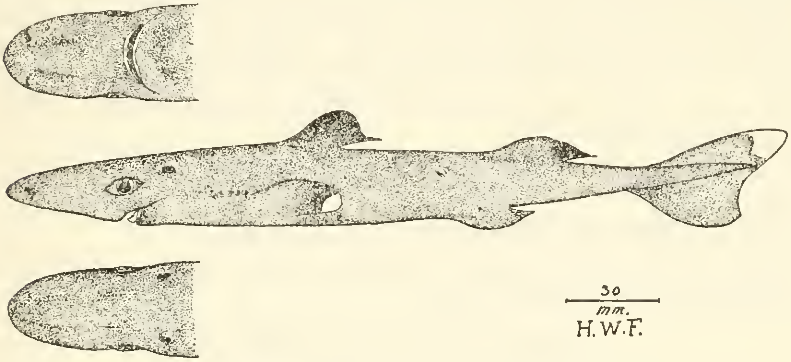

Figure 10.—*Heteroscymnoides marleyi* Fowler: Type.

Differs from *Heteroscymnus* Tanaka in the long snout with long preoral region, the nostrils subterminal, the advanced first dorsal and longer low second dorsal.

HETEROSCYMNOIDES MARLEYI Fowler

Figure 10

Heteroscymnoides marleyi Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 240, fig. 4, 1934 (type locality: Durban Coast at Point Ocean Beach, Natal).

Heteroscymnus longus (not Tanaka) Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 191 (Durban coast at Point Ocean Beach).—Barnard, Ann. South African Mus., vol. 21, pt. 2, p. 1013, 1927 (copied).

Depth $9\frac{2}{3}$ to last caudal vertebra, body somewhat compressed; head $3\frac{3}{4}$, width $2\frac{1}{6}$. Snout $2\frac{1}{10}$ in head, width $1\frac{1}{6}$ its length; eye $6\frac{3}{4}$ in head, $3\frac{1}{3}$ in snout, $3\frac{1}{2}$ in interorbital; mouth width $3\frac{1}{4}$ in head, slightly arched, with deep straight groove across each angle backward ⅗ to gill opening; teeth in 20 rows in each jaw, upper slightly raptorial, lower larger, compressed, sectorial, not serrated; median lower tooth present; nostrils large, oblong, at first third in snout; internarial equals preoral length, which 2⅗ in head; interorbital 1⅘, broadly convex. Gill openings small, last before pectoral. Spiracle equals pupil, eye diameter behind eye.

Scales moderate, triangular points with entire edge, each with median longitudinal groove.

First dorsal origin little nearer snout tip than subcaudal origin, depressed fin entirely before middle in total, fin length 2 in head; second dorsal origin little nearer first dorsal origin than last caudal vertebra and ends in slender point behind like first dorsal, fin length 1⅘ in head; caudal 3⅘ in rest of body, subcaudal 1½ in caudal length; least depth of caudal peduncle 9 times in head; pectoral 2⅕, width 2½ its length, reaches middle of first dorsal; ventral length 2¼ in head.

Brownish black. Tips of caudal and pectoral fins white. Eye violet.

Natal. Characters contained in those of the genus.

A.N.S.P. Durban coast at Point Ocean Beach, Natal. April 1, 1923. H. W. Bell Marley. Length, 128 mm. Type.

Genus PSEUDOSCYMNUS Herre

Pseudoscymnus HERRE, Copeia, No. 3, p. 124, fig. 2, 1935. (Type, *Pseudoscymnus boshuensis* Herre, orthotypic.)

Body elongate, fusiform: Groove on each side from above pectoral origin to above ventral. Head rather small, somewhat depressed, flattened above. Snout short, broadly rounded. Eyes large, elongate, without nictitating membrane. Mouth gently arched, with very long labial fold concealing each angle. Teeth unlike in two jaws 18 rows in each. Upper teeth slender, pointed, several rows functioning. Lower teeth broad, with single, triangular serrate cusp on a broad and long base, slightly oblique, but one row visible. Nostrils very far forward. Gill openings narrow, in front of pectoral. Spiracle large, transverse, on top of head well behind eyes. Scales on lower side of snout conspicuously larger than elsewhere, simple, smooth, triangular, imbricate. Elsewhere scales minute, closely appressed, widely spaced, more or less keeled, and trifid with long central point and with 2 lateral points at right angles to central one. Fins small. Dorsals without spines, first between pectorals and ventrals and origin of second over hind part of ventrals.

Distinguished by its serrate lower teeth, position and character of fins, and in the presence of two kinds of scales.

PSEUDOSCYMNUS BOSHUENSIS Herre

Pseudoscymnus boshuensis HERRE, Copeia, No. 3, p. 124, fig. 2, 1935 (type locality: Boshu, Sagami Bay, Japan).

Depth 8 in total; head measured to first gill opening 2⅕, width 1¼. Snout 4½ in head; eye 4¾, 1½ in snout, 2⅛ in interorbital; mouth width gently arched, width 3⅓ in head; upper lip extended laterally into prolonged skinny flap reaching far below mouth and concealing its outer fourth; upper teeth simple, awl-shaped, with 4 rows of different sizes in use; only 1 row visible in lower jaw, serrate cusps slightly oblique, with more or less evident basal notch on outer side; space between outer nasal edges 3⅔ in head, internasal space 4¾, lower or innermost concealed by scaly flap; interorbital 2⁹⁄₁₀, low. Gill openings narrow. Spiracle 2⅖ in orbit.

Scales smooth as stroked toward caudal, very rough and spinescent as rubbed toward head.

Small first dorsal well premedian, base 3 in head measured to first gill opening, hind edge truncate; second dorsal larger, middle of base over hind end of ventral base, base 2⅓ in head, hind edge slightly concave; subcaudal origin little in advance of upper caudal origin, fin 3⅒ in total fish, front edge of subcaudal 2¼ in caudal length; least depth of caudal penduncle 5¼ in head to first gill opening; pectoral 1¼, width 2 in its length; ventral 1¼ in head.

Color in alcohol blackish brown. Peculiar scales on lower side of snout glisten with brilliant metallic luster. Dorsals, subcaudal, and paired fins black with pale margins.

Length, 337 mm. (Herre.)

Japan.

Genus SOMNIOSUS Lesueur

Somniosus LESUEUR, Journ. Acad. Nat. Sci. Philadelphia, vol. 1, p. 222, 1818. (Type, *Somniosus brevipinna* Lesueur, monotypic.)

Laemargus MÜLLER and HENLE, Sitz. Ber. Akad. Wiss Berlin, p. 116, 1837. (Atypic. Type, *Squalus borealis* Scoresby, *in* Müller and Henle, Syst. Beschr. Plagiostomen, p. 93, 1841. Type, *Squalus borealis* Scoresby, designated by Jordan, Genera of Fishes, pt. 2, p. 192, 1919.)

Leiodon WOOD, Proc. Boston Soc. Nat. Hist., vol. 2, p. 174, 1846. (Type, *Leiodon echinatum* Wood, monotypic.)

Rhinoscymnus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 264. (Type, *Scymnus rostratus* Risso, monotypic.)

Body elongate, robust. Head rather short. Snout moderate. Mouth transverse, with deep straight groove across each angle and with labial folds. Upper teeth pointed, raptorial, several series functional; lower teeth wider, sectorial, with cusp directed obliquely outward, presenting inner edge of each tooth toward upper teeth and with notch on outer edge at base. Nostrils near snout end.

Gill openings narrow, hardly extend above level of pectorals. Spiracles moderate, behind and slightly above level of eye. Tubercles small, uniform.

Two species in Arctic and North temperate seas. Oviparous, though the eggs without a horny capsule and deposited on the sea bottom.

SOMNIOSUS MICROCEPHALUS (Schneider)

Squalus microcephalus Schneider, Syst. Ichth. Bloch, p. 135, 1801 (type locality: Glacial Sea).

Acanthorhinus microcephalus Blainville, Bull. Soc. Philomath. Paris, vol. 8, p. 121, 1816 (name only).

Somniosus microcephalus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 129, 1901 (Tokyo).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 638, 1903 (Tokyo).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 54, 1908 (Arctic Seas south to Japan, Cape Cod and France).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 241, pl. 15, figs. 4–6, 1913 (Massachusetts).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).—Soldatow and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 17, 1930 (Far East Seas).

Acanthorhinus norwegianus Blainville, Bull. Soc. Philomath. Paris, vol. 8, p. 121, 1816 (name only).

Squalus norvegianus Blainville, Faune Française, Poissons, p. 61, 1825 (Mers du Nord; on *Haa-skierding* Gunner, Act. Nidrosiana Trondhjem, vol. 2, p. 330, pls. 10–11, 1763).

Somniosus brevipinna Lesueur, Journ. Acad. Nat. Sci. Philadelphia, vol. 1, p. 222, pl., 1818 (type locality: Near Marblehead, Mass.).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 240, pl. 15, figs. 1–3, 1913 (Sagami Sea, Japan).

Squalus borealis Scoresby, Arctic regions, vol. 1, p. 538, pl. 15, figs. 3-5, 1820 (type locality: Spitzbergen Sea).

Scymnus rostratus Risso, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 138, pl. 3, fig. 7, 1826 (type locality: Nice).

Scymnus gunneri Thienemann, Lehrb. Zoologie, p. 1828 (on Gunner).

Scymnus glacialis Faber, Nat. Fische Islands, p. 23, 1829 (type locality: Iceland).

Scymnus micropterus Valenciennes, Nouv. Ann. Mus. Hist. Nat. Paris, vol. 1, p. 458, pl. 20, 1832 (type locality: "Habitat in Oceano boreali").

Leiodon echinatum Wood, Proc. Boston Soc. Nat. Hist., vol. 2, p. 174, 1846 (type locality: "Taken about 80 miles east of Portland").

Squalus norvegicus Gray, Cat. Fish. Gronow, p. 8, 1854 (type locality: Biorn Island, Norwegian Sea).

Depth 5⅞ to 6⅕ to subcaudal origin; head 4⅛ to 4⅖. Snout 2½ to 2¾ in head; orbit 9 to 11½, 3⅓ to 4¼ in snout; mouth width subequal with snout, with groove at angle extending back or little behind spiracle; teeth in 70 rows above, narrower than lower, 54 rows below, roots variably slender or elongate to short and wide in lower; nostrils about first third in snout; preoral length 2⅕ to 2¼ in head; interorbital rather elevated. Gill openings equidistant, 2⅘ to 3 in snout length, upper edge of last before pectoral origin. Spiracle nearly or quite equals orbit, superior, distant from upper hind orbital edge space equal to 2⅗ to 3 in snout length.

Scales minute simple or curved tubercles, with 3 to 6 ridges converging apically.

First dorsal origin nearer snout tip than caudal tip, variably nearer pectoral or ventral origins, fin length 1⅗ in head; second dorsal origin about over last fourth in ventral base, fin length 1¾ to 1⅞ in head; caudal 3⅗ to 3¾ in rest of body, front subcaudal edge 1⅔ in caudal length or 1⅖ to 1½ in head; least depth of caudal peduncle 4¾ to 5⅕; pectoral 1⅗ to 1⅔, width 2⅛ to 2½ its length; ventral length 1⅘ to 1⅞ in head.

Blackish brown. Length, 2,692 mm. (Garman.)

Arctic Seas, south to Japan, Massachusetts, and France. Though Garman has separated *Somniosus brevipinna* Lesueur as a distinct species, I do not feel his distinctions are conclusive. The position of the first dorsal as well as the appearance of the scales and teeth are likely only individual variations as he figures them.

Genus ECHINORHINUS Blainville

Echinorhinus Blainville, Bull. Soc. Philomath. Paris, vol. 8, pl. 121, 1816. Type, *Squalus spinosus* Gmelin, monotypic.)

Goniodus Agassiz, Poissons fossiles, vol. 3, p. 183, 1836. (Type, *Squalus spinosus* Gmelin.)

Rubusqualus Whitley, Australian Zool., vol. 6, p. 311, 1931. (Type, *Echinorhinus mccoyi* Whitley, orthotypic.)

Body partly fusiform, longer than tail. Head depressed. Snout short, tapering. Eye moderate, pupil erect, without nictitating membranes. Mouth wide, arched forward, with deep labial folds around angles. Teeth sectorial, smooth edged, alike in two jaws, broad, compressed, with cusp directed toward mouth angles and with denticle or more at side of base. Nostrils nearly midway from snout end and mouth, valve with pointed lobe in middle. Gill openings moderate, last before pectoral. Spiracle minute. Skin with scattered tubercles and bucklers. Two dorsals, close together, behind middle in total length, spineless. Tail short, without lateral folds or pits.

One species living. Fossils known from the Tertiary.

ECHINORHINUS BRUCUS (Bonnaterre)

Squalus brucus Bonnaterre, Tableau encyclop. Ichth., p. 11, 1788 (type locality: The Ocean).

Echinorhinus brucus Parker, Trans. New Zealand Inst., vol. 16, p. 280, 1884 (Dunedin, New Zealand).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 243, 1913 (Pacific and Australia).—Waite, Rec. Canterbury Mus., vol. 2, pt. 1, p. 17, 1913 (Opotiki, Bay of Plenty).—Phillipps, New Zealand Journ. Sci. Techn., vol. 10, No. 4, p. 221, fig. 1, 1928 (Cook Strait).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).

Squalus spinosus Gmelin, Syst. Nat. Linn., vol. 1, p. 1500, 1789 (type locality: In Oceano).—Walbaum, Artedi Pisc., vol. 3, p. 519, 1792 (copied).—Lacépède, Hist. Nat. Poiss., vol. 1, p. 283, pl. 3, fig. 2, 1798 (copied).—Schneider, Syst. Ichth. Bloch, p. 136, 1801 (Atlantic).

Echinorhinus spinosus Gray, List fish British Museum, p. 78, 1851 (Cape Seas).—Günther, Cat. Fishes British Mus., vol. 8, p. 428, 1870 (English coasts to Cape of Good Hope).—McCoy, Prodromus Zool. Victoria, dec. 2, pl. 144, 1887.—Boulenger, Proc. Zool. Soc. London, p. 243, 1889 (Muscat).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 44, 1890 (reference).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 42, 1908 (North Atlantic, Mediterranean, South Africa, Australia, New Zealand).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—Jordan, Tanaka, and Snyder, Journ. Coll. Sci. Tokyo, vol. 33, p. 23, 1913 (Japan).

Echinorhinus obesus Andrew Smith, Ill. zoology South Africa, Fishes, pl. 1, 1849 (type locality: Cape of Good Hope).

Echinorhinus cookei Pietschmann, Anz. Akad. Wiss. Wien, Nachr. 65, p. 297, 1928 (type locality: Hawaii); Bishop Mus. Bull. 73, p. 3, fig. 1, 1930 (teeth and scales; type, from south coast of Kauai).

? *Echinorhinus* (*Rubusqualus*) *mc coyi* Whitley, Australian Zool., vol. 6, p. 311, 1931 (on *Echinorhinus spinosus*, said not of Gmelin, McCoy, 1887; type locality: Portland, Victoria); Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Depth 5¼ to subcaudal origin; head 4⅖, width 1⅖. Snout 3 in head; eye 6½, 2⅕ in snout, 4 in interorbital; mouth width 2 in head, well arched, labial fold around each angle; teeth in 20 rows in each jaw, sectorial, cusp with cutting edge inclined to horizontal and several notches each side of base; nostril at last fourth in snout, inferior, internarial 1⅓ in preoral length, which 2⅖ in head; interorbital 1⅗, low. Gill openings large, first and second more separated, last largest or 2⅗ in head. Spiracle small, close behind eye.

Skin with radiated bony tubercles with conic median spine, scattered, irregular, very variable.

First dorsal origin little behind ventral origin, fin length 1¾ in head; second dorsal origin over hind basal ventral edge, fin length 1⅞ in head; caudal 2¾ in rest of body, front subcaudal edge 2¾ in caudal length or 1⅔ in head; least depth of caudal peduncle 2⅗; pectoral length 1⅓, width about 1¾ its length; ventral length 1⅛ in head.

Purplish brown, paler below. Back and sides with numerous, rounded, darker spots. Whitish under chin and edge of lip. Tubercles white. Paired fins and caudal edged darker brown. Iris greenish black, with silvery and bronze green and blue radiating lines from pupil edge. Length, 2,193 mm. (McCoy.)

Arabia, South Africa, Japan, Victoria, New Zealand, Hawaii. Also in the Atlantic. I cannot find that *Echinorhinus cookei* is other than a variant of this species. It is based on an example 2,033 mm. long, which I have examined in the Bishop Museum at Honolulu. Whitley says of his *Echinorhinus* (*Rubusqualus*) *mc coyi*, "It differs from a specimen in the Australian Museum from Tuscany in having the eye over anterior portion of mouth, thicker and heavier tail, dorsal fins closer together, the first dorsal originating over the anterior portion of the anal instead of originating almost over the middle of that fin."

Order SQUATINAE

Mouth wide, anterior or terminally inferior, or entirely inferior. Snout sometimes extended into a "saw." Vertebrae with calcareous lamellae ranged in several concentric series or rings about central axis. Gill openings before pectoral. Dorsal fins small, posterior. Pectorals sometimes modified into lateral expansions.

Two widely divergent families, the angel sharks and the saw sharks, constitute this order. They graduate toward the skates. The saw sharks form an almost perfectly connected link between the sharks and the sawfishes.

ANALYSIS OF FAMILIES

a^1. Snout greatly produced in long bladelike saw, with sharp teeth on edges and with barbels ---------- Pristiophoridae

a^2. Snout short, obtuse; mouth anterior, terminal; pectorals produced, free from head ---------- Squatinidae.

Family PRISTIOPHORIDAE

Body long. Head greatly depressed. Snout produced in long flat blade, edge of each with series of sharp teeth suggestive of *Pristis;* barbel below each side of blade some distance before nostrils. Eyes superior, elongate, directed laterally; no nictitating membranes. Mouth inferior, behind eyes. Rudimentary labial fold at angles of lower jaws. Teeth small, numerous, number of series in function at once. Nostrils inferior, valve conspicuous. Gill openings lateral, before pectoral. Spiracles rather large, behind eye. Scales fine, smooth. Dorsals well developed, first above body, second above tail, spineless. No anal. Tail with dermal fold at lower edge of each side. Subcaudal reduced, separated from tip by notch and supracaudal broader backward. Pectoral rather long.

A small group of sharks, greatly resembling the sawfishes but of smaller size, with their gill openings lateral and the saw furnished with a pair of tentacles. Indo-Pacific. Known from fossils in the Cretaceous and Tertiary.

ANALYSIS OF GENERA

a^1. Gill openings 5 ---------- Pristiophorus

a^2. Gill openings 6 ---------- Pliotrema

Genus PRISTIOPHORUS Müller and Henle

Pristiophorus Müller and Henle, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 116. (Atypic. Type, *Pristis cirratus* Latham); Arch. Naturg., pt. 1, p. 399, 1837. (Type, *Pristis cirratus* Latham, monotypic.)

Body elongate, tapering to head and tail. Tail flattened below. Head depressed. Snout shorter in young, barbel longer in young. Rostral teeth sharp and of unequal length. Eye large, before mouth. Teeth in jaws close-set, each with sharp cusp on broad base. Nostrils not connected with mouth. Gill openings 5, moderate. Dorsals subequal, spineless, hinder angles produced. First dorsal before ventrals, second fin large. Lower caudal lobe narrow. Pectorals broad, free from head. Ventrals small, edge oblique.

ANALYSIS OF SPECIES

a^1. Dorsals and pectorals entirely covered with scales; upper teeth in about 42 rows ______ **cirratus**

a^2. Dorsals and pectorals nearly covered with scales; upper teeth in about 46 to 58 rows ______ **japonicus**

a^3. Dorsals and pectorals nearly naked; upper teeth in 35 to 39 rows _ **nudipinnis**

PRISTIOPHORUS CIRRATUS (Latham)

Pristis cirratus Latham, Trans. Linn. Soc. London, vol. 2, p. 281, pl. 26, fig. 5, pl. 27, 1794 (type locality: New Holland).

Pristis cirrhata Schneider, Syst. Ichth. Bloch, p. 351, pl. 70, fig. 2, 1801 (on Latham).

Pristis cirrhatus Cuvier, Règne animal, vol. 2, p. 132, 1817 (reference).—Gunn, Ann. Mag. Nat. Hist., vol. 1, p. 108, 1838 (Western Port, Tasmania).—G. Bennett, Gatherings Nat. Australasia, p. 35, 1860 (Port Jackson).

Pristiophorus cirratus Müller and Henle, Syst. Beschr. Plagiostomen, p. 98, 1841 (Port Jackson, New Holland).—Gray, List fish British Museum, p. 88, 1851 (not Japan; Tasmania, Australia).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 61, 1865 (Australia, Tasmania).—Günther, Cat. Fishes British Mus., vol. 8, p. 432, 1870 (Tasmania, New Holland).—Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 220, 1872 (Hobart Town).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 369, 1881 (Tasmania, South Australia, Port Jackson).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 13, 1888 (Broken Bay, Manly, Port Jackson).—Ramsay, Proc. Linn. Soc. New South Wales, vol. 5, p. 97, 1890 (Port Jackson).—Waite, Mem. Australian Mus., vol. 4, p. 37, 1899 (New South Wales).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 56, 1908 (New South Wales, Victoria, Tasmania).—McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 9, 1911 (New South Wales and Bass Strait, 15–45 fathoms).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 245, 1913 (East Australia, New South Wales, Australia).—Waite, Rec. South Australian Mus., vol. 2, p. 25, 1921.—Barnard, Ann. South African Mus., vol. 21, p. 53, 1925 ("identification of a specimen from False Bay by Dr. Boulenger").—McCulloch, Fishes of New South Wales, ed. 2, p. 9, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Pristiphorus cirratus Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 220, 1872 (Hobart Town, Tasmania).

Pristiphorus cirrhatus Stead, Fishes of Australia, p. 233, 1908 (Port Jackson).

Squalus anisodon Lacépède, Hist. Nat. Poiss., vol. 4, pp. 679, 680, 1802 (type locality: New Holland).

Squalus tentaculatus Shaw, General Zoology, vol. 5, p. 359, 1804 (type locality: New Holland).—Shaw and Nodder, Nat. Misc., vol. 15, pl. 630, 1804 (Southern Seas).

Depth 14 to subcaudal origin; head 2¼, width 5. Snout 1¼ in head, rostrum armed with 24+26 principal denticles also usually smaller on each side of base of each principal one; barbel 4⅖ in snout; eye 12¼ in head, 9⅖ in snout, 1⅖ in interorbital; mouth width 8⅕ in head; 2 short rudimentary grooves at each mouth angle; teeth in 36 rows above, 30 below, each with broad low simple cusp; nostrils at last sixth in preoral length, internarial 1⅗ in mouth width; interorbital 9⅛ in head, with slight concavity medianly. Gill openings subequal, last 3 closer. Spiracles large, half eye diameter and close behind eye.

Scales broad, each ending in slender, acuminate point, with median keel. Dorsals and paired fins scaled.

First dorsal close behind pectoral, obtuse, front edge 4¼ in head, with blunt hind point; second dorsal inserted little nearer subcaudal origin than first dorsal origin, similar to first dorsal, front edge 4 in head; caudal 2, subcaudal without lobe; pectoral 3¼, width 1⅓ its length; ventral 5 in head.

Gray brown above, paler to whitish below. Along each side of rostral cartilages pale streak, also hind edges of paired fins pale or whitish.

South Africa, New South Wales, Victoria, Tasmania, South Australia, Philippines. Reaches 1,200 mm.

10170 (D. 5536). Apo Island, S. 26° W., 11.8 miles (lat. 9° 15′ 45″ N., long. 123° 22′ 00″ E.) between Negros and Siquijor. August 19, 1909. Length, 490 mm.

U.S.N.M. No. 40003. Port Jackson. Australian Museum.

U.S.N.M. No. 59842. Port Jackson. D. G. Stead.

PRISTIOPHORUS JAPONICUS Günther

Pristiophorus japonicus Günther, Cat. Fishes British Mus., vol. 8, p. 433, 1870 (type locality: Japan).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 61, 1897.—Jordan and Snyder, Annot. Zool. Japon., vol. 3, pp. 40, 129, 1901 (Nagasaki).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 639, 1903 (Aomori; Nagasaki).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 57, 1908 (type; Japan).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 652, 1908 (Japan).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 246, pl. 52, fig. 3, pl. 56, fig. 6, pl. 58, fig. 5, pl. 64, fig. 1, 1913 (anatomy) (Yenoura, Japan).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 188, 1920 (Sagami).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Mokpo, Korea).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 590, 1930 (Tokyo); Proc. 4th (1929) Pacific Sci. Congr. Java, p. 497, 1930 (Japan); Hong Kong Nat., vol. 1, p. 129, fig. 13, 1930 (Japan).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 18, 1930 (Far East Sea).—Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 10, 1931 (Nagasaki; Fusan).—Fang and

Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 252, fig. 7, 1932 (Chefoo).—Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 95, 1933 (Chusan).—Tanaka, Jap. Fish. Life Colours, No. 25, 1933.

Pristiophorus cirratus (not Latham) Schlegel, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 305, 1850 (Nagasaki Bay).—Gray, List fish British Museum, p. 88, 1851 (Japan).

Pristiophorus cirrhatus Schlegel, *in* Siebold's Fauna Japonica, Poiss. pt. 15, pl. 137, 1850.

Head about 2⅗ to subcaudal origin; width 4¼. Snout 1⅓ in head, rostrum armed with 24+26 principal denticles, also 2 or 3 smaller intermediate teeth between larger teeth; barbel 3⅖ in snout; eye 20⅖ in head, 16 in snout, 2⅓ in interorbital; mouth wide, rudimentary labial fold at angle of lower jaw; teeth in 46 (46 to 58) rows in upper jaws, 38 or more in lower, crown broad, with sharp slender cusp; nostril in front of eye, about ¼ of space from mouth to barbel; interorbital 9⅕ in head. Gill openings moderate, wide as spiracle or ⅔ orbit, before pectorals. Spiracles long as eye.

Scales minute, with strong median keel, irregular, point projecting.

First dorsal origin behind hind depressed pectoral edge length of first dorsal base, fin length 4⅔ in head; second dorsal length 4½, inserted behind depressed ventral length of second dorsal base; caudal to upper lobe origin, 4⅔ in rest of body, subcaudal narrow; pectoral 3½ in head, width 1⅕ its length; ventral 5 in head.

Olivaceous brown above, whitish below. On foramen in front of skull narrow whitish band near each edge of rostrum and another on each flank. Each side of white bands on rostrum general color darker brown, appearing as 4 dark longitudinal bands. Length, 864 mm. (Schlegel; Garman.)

Japan, Korea. The specimen described from Aomori by Jordan and Fowler measured 1,023 mm. Schlegel says that according to Bürger it reaches 1,220 or 1,525 mm.

PRISTIOPHORUS NUDIPINNIS Günther

Pristiophorus nudipinnis Günther, Cat. Fishes British Mus., vol. 8, p. 432, 1870 (type locality: Tasmania and New Holland).—Klunzinger, Arch. Naturg., vol. 38, p. 45, 1872 (Port Phillip); Sitzungsber. Akad. Wiss. Wien., math.-nat. Cl., vol. 80, pt. 1, p. 428, 1880 (Port Phillip).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 369, 1881 (Tasmania; South Australia).—McCoy, Prodromus Zool. Victoria, dec. 6, pl. 56, fig. 2, 1887.—Lucas, Proc. Roy Soc. Victoria, new ser., vol. 2, p. 45, 1890 (passim).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 57, 1908 (type); type *Pristiophorus owenii*).—McCulloch, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 10, pl. 1, fig. 2, 1911 (South Australia).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 247, 1913 (Melbourne, Hobsons Bay, Tasmania).—Waite, Rec. South Australian Mus., vol. 2, p. 25, fig. 35, 1921.—McCulloch, Fishes New South Wales, ed. 2, p. 9, pl. 2, fig. 26b, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Pristiphorus nudipinnis CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 220, 1872 (Hobsons Bay).

Pristiophorus owenii GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 432, 1870 (no locality).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).

Head 3 to subcaudal origin; width 3¼. Snout 1⅓ in head, rostrum armed with 21+20 principal denticles, usually 1 and sometimes 2 intermediate teeth between larger teeth, with age many as 4; barbel 2⅖ in snout; orbit 10½ in head, 7 in snout, 1⅖ in interorbital; teeth in 35 rows in upper jaw, crowns broad, each with strong, narrow, median cusp; interorbital 6½ in head. Gill openings nearly equidistant, last 2 closer. Spiracles about equal orbit.

Scales minute, crowns with three keels (3 to 7) on forward half, smooth posteriorly; scales absent from marginal portions of dorsals and pectorals.

First dorsal origin behind depressed pectoral tip length of orbit, fin length 3⅛ in head; second dorsal origin behind depressed ventral length of second dorsal base; caudal to subcaudal origin 5 in rest of body, subcaudal narrow; pectoral 2⅘ in head, width equals its length; ventral length 3¼ in head.

Brown, lighter beneath. Rostrum longitudinally striped with brown and light. Length, 445 mm. (McCulloch; Garman.)

Victoria, Tasmania, South Australia. Types of the species and *Pristiophorus owenii* in the British Museum, the largest 1,000 mm. long.

Genus PLIOTREMA Regan

Pliotrema REGAN, Ann. Natal Gov. Mus., vol. 1, p. 1, 1906. (Type, *Pliotrema warreni* Regan, monotypic.)

Rostral teeth serrated behind. Pupil subcircular. Gill openings 6 each side.

Differs from *Pristiophorus* in 6 gill openings.

PLIOTREMA WARRENI Regan

Pliotrema warreni REGAN, Ann. Natal Gov. Mus., vol. 1, pt. 1, p. 1, pl. 1, 1906 (head) [type locality: Natal; False Bay, Cape of Good Hope; p. 24 (Bird Island)]; Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 57, 1908 (type).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 248, 1913 (Natal; Cape of Good Hope).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 284, 1916 (references).—GILCHRIST, Marine Surv. South Africa, Spec. Rep., no. 2, p. 50, 1922 (off Durban).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 53, pl. 3, fig. 3, 1925 (False Bay to Natal).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 192 (Natal).

Depth 9⅘ to subcaudal origin, body with well-developed dermal ridge each side of tail; head 2½, width 5. Snout 1⅓ in head; eye 12, 9⅓ in snout; mouth width 8 in head, little arched, groove at each angle; upper jaw teeth in 40 to 44 rows, lower 31 to 34; rostral teeth compressed, pointed, unequal; nostrils at last seventh in preoral length, internarial 9½; preoral length slightly over 1⅐ in head; interorbital low. Gill openings subequal, last 2 closer, before pectoral. Spiracle close behind eye, less than half of eye.

Scales small, pointed, with median keel and sometimes with pair of lateral keels, close-set on lower parts of body and front fin edges, terminal parts naked.

First dorsal origin behind pectoral base but before hind inner pectoral angle, fin length 2⅔ in head; second dorsal begins orbital length behind ventral base, fin length 3 in head; caudal 4 in rest of body; pectoral 2⅔ in head, width 1⅖ its length; ventral length 4⅕ in head.

Uniform grayish. Pupil emerald green. Length, to 810 mm. (Regan; Barnard.)

South Africa. The two original specimens 750 mm. Type in the British Museum.

Family SQUATINIDAE

Body greatly depressed, broadened. Head depressed, profile rounded as seen from above. Snout obtuse, wide. Eyes small, well separated. Mouth anterior. Teeth with broad backward extended base anteriorly, with acute rather narrow somewhat compressed cusp with sharp ridge each side, continued to edge of base and with extension downward below cone in front and another backward behind; usually no median tooth on symphysis; about 20 rows of jaw teeth with 3 or 4 series functional. Nostrils on front snout edge, with skinny flaps. Gill openings lateral, wide, partly inferior and partly hidden by pectoral base. Spiracles wide. Scales of young with broad base, somewhat stellate with slender hooked cusp, conic in terminal portion and ridged with 4 keels on more basal section. Body smoother below. Dorsals 2, small, subequal, on tail, supracaudal and subcaudal moderate. Caudal small. Pectoral free from head, expanded forward and backward.

Small sharks of warm or tropical seas, of interest as intermediate between sharks and rays, though more like the latter in habit. Viviparous, about 20 young produced at one time. Perfected fossils known from the Cretaceous and Tertiary.

Genus SQUATINA Duméril

Squatina Duméril, Zool. Analytique, p. 102, 1806. (Type, *Squatina angelus* Duméril=*Squalus squatina* Linnaeus, virtually tautotypic.)—Valmont, Dict. Hist. Nat., No. 1, p. 273, 1768; No. 11, p. 46, 1769; No. 12, p. 593, IV, 1769 (nonbinomial; inadmissible).

Rhina Schaeffer, Epistola studii ichth., p. 20, 1760. (Type, *Squalus squatina* Linnaeus.)—(Klein) Walbaum, Artedi Pisc., vol. 3, p. 580, 1792. (Type, *Squalus squatina* Linnaeus, monotypic, inadmissible.)

Thaumas (not Huebner 1820, Ehrenberg 1832) MÜNSTER, Beitr. Petrefak., vol. 5, p. 62, 1842. (Type, *Thaumas alifer* Münster, monotypic. Fossil.)

Phorcynis THIOLLIÈRE, Poiss. Fossiles Bugey, p. 9, 1854. (Type, *Phorcynis catulina* Thiollière, monotypic. Fossil.)

Scaldia (not Ryckholt 1851 in mollusks) LE HON, Prélim. Mém. Poiss. Tert. Belge, p. 7, 1871. (Type, *Scaldia biforis* Le Hon, monotypic. Fossil.)

Trigonodus (not Newberry and Worthen, 1866) WINKLER, Arch. Mus. Teyler, vol. 4, p. 14, 1876. (Type, *Trigonodus primus* Winkler, monotypic. Fossil.)

Body, head, and tail depressed and flattened. Head short, wide. Eyes superior, eyeball free from edge of orbit. Mouth broad, one labial fold on upper jaw and 2 on lower. Nostrils anterior, thin fold along each side from nostril to angle of jaws. Front nasal valve with 2 cirri and more or less fringed in young. Gill openings 5, crowded together before pectoral. Spiracle crescentic, behind eye. Caudal axis not raised, supracaudal fin shorter and subcaudal widening backward. Blunt keel each side of tail posteriorly. Pectorals broad, free from head.

ANALYSIS OF SPECIES

a^1. Mid-dorsal series of enlarged scales with age.
  b^1. Interspiracle width greater than interorbital width------------ japonica
  b^2. Interspiracle width less than interorbital width------------ tergocellata
a^2. No mid-dorsal series of enlarged scales with age.
  c^1. Dermal denticles not carinate------------------------------- australis
  c^2. Dermal denticles tricarinate---------------------------------- africana

SQUATINA JAPONICA Bleeker

Squatina japonica BLEEKER, Act. Soc. Sci. Indo-Néerl. (Japan), vol. 3, No. 3, p. 40, 1858 (type locality: Nagasaki).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 336 (Tokyo), p. 740 (Yokohama), 1900; Annot. Zool. Japon., vol. 3, pp. 40, 129, 1901 (Yokohama; Nagasaki).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 641, 1903 (Kobe; Nagasaki).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Tokyo).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 188, 1920 (Tokyo market).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 590, 1930 (Tokyo); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (Japan); Hong Kong Nat., vol. 1, p. 130, 1930 (Japan).—SCHMIDT and LINDBERG, Bull. Acad. Sci. U. S. S. R., p. 136, 1930 (Tsuruga).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 254, fig. 18, 1932 (Chefoo).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 96, 1933 (Chusan).

Rhina japonica GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 255, 1913 (Japan).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. II, p. 10, 1931 (Nagasaki).—TANAKA, Jap. Fish, Life Colours, No. 28, 1933.

Squatina vulgaris (not Risso) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, pl. 35, 1841 (snout).—SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 305, pl. 136, 1850 (southwest coast, Japan).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 21, 1853 (Japan); (Japan), vol. 26, p. 44, 1857 (Japan).

Rhina vulgaris MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Yokohama).

Rhina squatina (not Linnaeus) Günther, Cat. Fishes British Mus., vol. 8, p. 430, 1870 (Japan).—Elera, Cat. Fauna Filip., vol. 1, p. 617, 1895 (Luzon, Manila, Navotas).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 61, 1897.

Squatina nebulosa Regan, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 439, 1906 (type locality: Japan).

Rhina nebulosa Garman, Mem. Mus. Comp. Zool., vol. 36, p. 256, 1913 (copied).

Depth 9⅔ to subcaudal origin; head to hind edge of gill opening 3⅘, width 3½. Snout 3¼ in head; eye 12½, 3¼ in snout, 4¾ in interorbital; dentary width 1⅗ in head; teeth in 20 to 22 rows in jaws, narrowly triangular; internasal 1⅓ in interorbital; front nasal valve broad, ends in rather long point and with inner tentacle equally as long; hind nasal valve obtuse flap; interorbital 2⅔ in head, depressed concavely with bulge above each eye. Spiracles subequal with eye, front edge fringed, interspiracle width greater than interorbital.

Scales simple, conic points, rough to touch. Median row of vertebral tubercles, about 36 to first dorsal.

First dorsal length 3 in head; second dorsal length 3⅕; upper caudal lobe 1⅔, broad, subcaudal more angular, 1⅗; pectoral length 2⅗ to subcaudal origin, width 1¾ in its length; ventral 3⅔ in length to subcaudal origin, with slender point behind.

Brown above, under surfaces whitish. Each tubercle on back gives appearance of finely dotted with darker.

Japan, Korea. Garman describes the "subcaudal vertically subtruncate, convex" and Schlegel's figure shows it similar, though the impression one gets is that it may have been damaged. My specimen shows a more slender angular lobe ending in a rather narrow point.

U.S.N.M. No. 49408. Yokohama. K. Otaki.
U.S.N.M. No. 57519. Japan. P. L. Jouy.
U.S.N.M. No. 75873. Japan ? P. L. Jouy. Length, 440 mm.

SQUATINA TERGOCELLATA McCulloch

Squatina tergocellata McCulloch, Biol Res. *Endeavour*, vol. 2, pt. 3, p. 84, pl. 15, text fig. 2, 1914 (front of head) (type locality: Great Australian Bight, in 160–200 fathoms).—Waite, Rec. South Australian Mus., vol. 2, p. 26, fig. 37, 1921.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).—Whitley, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Squatina squatina (not Linnaeus) Waite, Mem. Australian Mus., vol. 4, p. 37, 1899 (all along coast line New South Wales).

Head to hind edge of gill openings 4 to subcaudal origin, width 3½. Snout 3¾ in head; eye about 9½, 2⅕ in snout, 3 in interorbital; teeth strong in 2 rows anteriorly and in 3 on sides of each jaw; skinny fold each side of head, very short indistinct lobe anteriorly ending in front of mouth angle, remaining portion of nearly equal width throughout; inner nasal lobes very large, in 2 portions, innermost forms ramose flap on short stalk and other portion broader with ramose border; outer nasal lobes hidden beneath others, margins fringed; interocular 2¾ in head, concave. Spiracle about ¾ of eye, interspiracle width slightly less than interocular.

Snout and interorbital with stout, spiniform tubercles, row of 3 from snout to supraorbital, 1 or 2 smaller around base of last, another before eye, 3 more between eye and spiracle superiorly; back with minute tricarinate denticles, median somewhat enlarged, form series nearly to first dorsal; present on paired fins basally, rest of upper surfaces naked; head granular above and before eyes, and on its sides; tail uniformly with minute denticles above; head and body below naked, on tail closely covered with imbricate denticles not extended to base.

First dorsal length 2⅞ in head; second dorsal length 2½; upper caudal lobe 2, subcaudal length 2⅕; pectoral length 2½ to subcaudal origin, width 1¾ its length; ventral 3⅖ to subcaudal origin.

Light yellowish brown, closely covered with small, round, blue spots. Upper surface with 8 dark-edged and dark-spotted ocelli, 4 in row across back behind head, 2 outer larger and on pectorals; 4 others in line with front of ventrals, 2 inner larger, others on pectorals posteriorly less marked than first. Several other paired brown rings at intervals along back. Length, 420 mm. (McCulloch.)

Great Australian Bight, New South Wales.

SQUATINA AUSTRALIS Regan

Squatina australis REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 438, 1906 (type locality: Port Jackson).—WAITE and MCCULLOCH, Trans. Roy. Soc. South Australia, vol. 39, p. 460, 1915 (Great Australian Bight, 80–140 fathoms).—WAITE, Rec. South Australian Mus., vol. 2, p. 25, fig. 36, 1921.—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 9, p. 21, fig. 27a, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 497, 1930 (reference).—WHITLEY, Mem. Queensland Mus., vol. 10, pt. 4, p. 200, 1934 (reference).

Rhina australis GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 255, 1913 (off Victoria, Australia).

Rhina squatina (not Linnaeus) GÜNTHER; Cat. Fishes British Mus., vol. 8, p. 430, 1870 (Sydney and Georgetown, Tasmania).—CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 221, 1872 (Melbourne market).—KLUNZINGER, Arch. Naturg., vol. 38, p. 47, 1872 (Hobson's Bay); Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, pt. 1, p. 429, 1880 (Hobsons Bay).—RAMSAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 97, 1880 (Port Jackson).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 368, 1881 (coast of Australia, Port Jackson).—JOHNSTON, Proc. Roy. Soc. Tasmania, 1882, p. 139, 1883.—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 12, 1888 (Port Jackson).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 44, 1890 (reference).

Squatina squatina Waite, Mem. Australian Mus., vol. 4, p. 37, 1899 (New South Wales).—Stead, Fishes of Australia, p. 233, 1908 (Port Jackson).—McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 10, 1911 (Shoalhaven Bight, Northwest of Greenly Island and 42 miles south of St. Francis Island, in 15–45 fathoms).

Depth 10¾ to subcaudal origin; head to hind edge of gill openings 4, width 3⅓. Snout 3⅔ in head; eye 14, 4 in snout, 5 in interorbital; teeth in 20 rows in jaws, slenderly or narrowly triangular; internasal 1$\frac{1}{10}$ in interorbital; front nasal valve moderate cutaneous flap, pointed, fringed and with shorter, similar, inner fringed tentacles; outer nasal valve broad obtuse cutaneous flap; interorbital 2⅞ in head, broadly convex. Spiracle little oblique, little larger than eye, front edge finely fringed and interspiracle width eye diameter greater than interorbital.

Scales simple, conic points, quite rough to touch. Median row of vertebral tubercles but very slightly larger than scales, about 42 before first dorsal.

First dorsal length 2¼ in head; second dorsal length 2½; upper caudal lobe 2, broad subcaudal little more angular so hind edge of fin slightly and widely notched, subcaudal length 1⅖ in head; pectoral length 2⅘ to subcaudal origin, width 1¾ its length; ventral 3⅗, with slender point behind.

Brown above, marked with minute to variously small pale spots, small ones very numerous and larger scattered about chiefly on outer portions of paired fins, though few also on dorsals and caudal. In addition whole upper surface marked with extremely numerous deep brown dots or minute specks, little darker than body color and not invading any of pale or whitish spots. Under surface whitish.

New South Wales, Victoria, South Australia, Tasmania. Apparently this species is chiefly distinguished by its coloration.

U.S.N.M. No. 39980. Port Jackson. Australian Museum. Length, 770 mm.

SQUATINA AFRICANA Regan

Squatina africana Regan, Ann. Natal Gov. Mus., vol. 1, pp. 242, 248, pl. 38, 1908 (type locality: Durban Bay, Natal).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, p. 284, 1916 (reference).—Gilchrist, Marine Surv. South Africa, Spec. Rep. No. 2, pt. 3, p. 50, 1922 (off Natal).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 54, pl. 3, fig. 5, 1925 (Natal).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 192 (Natal, in 270 fathoms).

Depth 8¾ to subcaudal origin; head 3¾, width 1⅛. Snout 4 in head, front of profile as seen above slightly concave; eye 9, 2⅓ in snout, 3⅓ in interorbital; mouth width 1⅚ in head, with broad labial fold around each mouth corner; 18 rows of upper teeth, 16 lower, none at symphysis, all erect simple conic points; fold each side of head lobed behind nostril and fringed flap in front with tentacle long as eye; internarial 3¼ in head; interorbital 2½, broadly and slightly concave. Spiracle little greater than eye or 2⅘ in interorbital.

Two spines each side of snout end; 2 spines before each eye and 4 or 5 behind; whole upper surface of body with scattered asperities crowded though not enlarged down median line, outer margins of all fins smooth; under surface of disk smooth, except some very fine close-set asperities on outer front pectoral and ventral edges.

First dorsal very slightly longer than second or 3 in head; caudal pointed, length 1⅖, subcaudal 1½ in caudal; pectorals form broad disk width, 1⅕ in its length, or pectoral length 2½ in body length to subcaudal origin; outer edge very slightly convex; ventral length equals head.

Upper surface of body nearly fawn color to prout's brown. On head before middle numerous variable pale spots, none larger than pupil, rather close set and some quite small. On back and paired fins basally, scattered round to ellipsoid pale spots, largest not exceeding eye. Margins of paired fins very narrowly whitish, submarginally dusky brown. Dorsals and caudal dark or dusky brown, margins broadly and irregularly pale. Under surface of disk whitish, submargins of paired fins broadly dusky all around, leaving only very narrow pale edge.

Natal.

A.N.S.P. No. 53011. Natal coast. H. W. Bell Marley. Length, 268 mm.

Order RAJAE

Body typically disklike, wide, flat, edges of disk usually formed by expanded pectorals. Eyes inferior. Mouth inferior, more or less protractile. Gill openings 5, inferior, slitlike. Spiracles present. Vertebrae cyclospondylous. Dorsal fins, when present, placed on tail. No anal fin. Caudal small or wanting, tail comparatively slender. Pectorals with long basal and many radial cartilages extending forward above gill openings.

A greatly modified group, very different from the typical sharks, though with complete intergradations. Excepting the skates most are ovoviviparous.

ANALYSIS OF FAMILIES

a^1. RHINOBATOIDEI. Disk narrow, elongate, short to broad; skull produced in median rostral cartilage, long to short; teeth small, in pavement; nasoral grooves absent or incipient; electric organs absent or incipient; pelvis transverse; tail with 2 dorsals and well-developed caudal.

  b^1. Rostrum produced, toothed on edges; no nasoral grooves; pectorals not extended forward on side of head, disk small________________ Pristidae

  b^2. Rostrum more or less produced, not expanded in sawlike blade.

    c^1. No nasoral grooves; pectorals extend to side of head, not reaching end of snout____ Rhinobatidae

    c^2. Nasoral grooves rudimentary or absent; pectorals extend to end of snout, rostral cartilage short, large disk broad and rounded__ Platyrhinidae

a^2. TORPEDOIDEI. Disk broadly rounded; snout short, obtuse; teeth raptorial, small, in bands; nasoral grooves present; well developed electric organs; pelvis arched backward, with lateral prepelvic extensions; tail short, with 2 dorsals, 1 dorsal or none and well developed caudal______ **Torpedinidae**

a^3. RAJOIDEI. Disk broad, angular to rounded; skull extended in narrow pointed rostral cartilage, rarely obsolete; teeth small, in pavement; nasoral grooves present; electric organs rudimentary or absent; pelvis transverse with lateral prepelvic extensions; tail moderate to slender, usually with 2 small dorsals and more or less imperfect membranous caudal________ **Rajidae**

a^4. MYLIOBATOIDEI. Disk broad to greatly so, polygonal to rounded; pelvis arched forward, with median prepelvic extension; tail slender, whiplike, without or with 1 to 3 serrated spines, rarely rayed fins present, sometimes only as low membranes.

  c^1. Teeth small, in pavement; pectorals form broad rounded to polygonal disk and usually obtusely pointed snout______________________ **Dasyatidae**

  c^2. Teeth broad, molarial; snout usually in single lobe, sometimes divided; pectorals form broad polygonal disk, angular__________ **Myliobatidae**

  c^3. Teeth minute, very numerous in bands; snout very wide, with 2 lateral lobes; pectorals and body very wide, massive, angular, disk polygonal____ **Mobulidae**

Family PRISTIDAE

Body elongate, robust, moderately depressed, flattened below. Fold along each side of tail. Snout extended in long, thin, flattened blade, each side of which with row of strong toothlike points set in sockets. Eye without nictitating membrane. Teeth in jaws obtuse, very small and numerous. Nostrils inferior. No tentacle. Spiracles rather large. Dorsals large, without spines, first nearly opposite or above ventrals. Caudal well developed, bent up, usually with lower or subcaudal lobe. Pectorals moderate, front edge quite free, not reaching snout.

One genus. Large fishes of tropical and subtropical seas. They often ascend tidal rivers. Living on the bottom the large sawlike rostrum is said to be used in raking or rooting up the sand and thus make available their food, which consists largely of various marine animals living on or near the sea bottom. Stories of sawfishes attacking large marine animals and cutting out portions of their flesh by blows of the saw are doubtful. The saws are, however, dangerous weapons and capable of causing serious lacerations to the incautious. The young are produced alive. Several fossils, as *Sclerorhynchus* from the Chalk of Mount Lebanon and *Propristis* from the Upper Eocene beds of Egypt, are interesting. The former, with more superficially placed rostral teeth without sockets in the rostral cartilages, suggests a closer approach to the usual dermal spines in the genus than any of the recent sawfishes. In *Propristis* the rostral teeth are also without sockets.

Genus PRISTIS Linck

Pristis Linck, Mag. Phys. Naturg. Gotha, ser. 3, vol. 6, p. 31, 1790. (Type, *Squalus pristis* Linnaeus, monotypic.)—Klein, Neuer Schauplatz, vol. 7, p. 403, 1779. (Type, *Squalus pristis* Linnaeus. Nonbinomial.)

Pristobatus Blainville, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816. (Type, *Pristis antiquorus* Latham=*Squalus pristis* Linnaeus, designated by Fowler, Geol. Surv. New Jersey Bull. 4, p. 81, 1911.)

Pristobatys Blainville, Nouv. Dict. Sci. Nat., ed. 2, vol. 27, p. 385, 1818. (Type, *Pristis antiquorus* Latham.)

Pristibatis Blainville, Faune Française, Poissons, p. 49, 1825. (Type, *Pristis antiquorus* Latham.)

Myriosteon Gray, Proc. Zool. Soc. London, p. 163, 1864. (Type, *Myriosteon higginsii* Gray, monotypic. Fragment of *Pristis* saw, supposed to be echinoderm!)

Pristiopsis Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 459. (Aug. 14). [Type, *Pristis perrotteti* Müller and Henle, orthotypic. *Pristiopsis* Schmidt, Ent. Zeitschr Stettin, 66 Jahrg., heft 2, p. 332, 1905, in *Rhynchota homoptera*, precluded (p. 384 "Ausgegeben im November 1905").]

Eopristis Stromer, Beitr. Pal. Oester. Uñgarn, vol. 18, p. 52 (16), 1905. (Type, *Pristis* (*Eopristis*) *reinachi* Stromer, monotypic. Fossil.)

Rostral teeth firmly imbedded in rostral cartilages, except in very young. Upper half of eye not free from orbit, lower half of orbit serving as nictitating membrane when eye retracted. Mouth transverse. Oral teeth small, pavementlike or smooth, rows 70 to 178 or more in upper jaw. Gill openings small, on under surface of head. Spiracle moderate, behind eye. Caudal axis elevated. Pectorals joined with head along gills but not reaching snout.

ANALYSIS OF SPECIES

a^1. Pristis. Subcaudal lobe absent.
  b^1. Rostral teeth 24 to 32 each side.
    c^1. First dorsal origin opposite ventral origins; second dorsal reaches caudal. **pectinatus**
    c^2. First dorsal origin more than ½ basal length behind ventral origins; second dorsal equals first dorsal.............................. **zijsron**
  b^2. Rostral teeth 21 each side; first dorsal origin ¼ its basal length behind ventral origins; second dorsal smaller than first.............. **clavata**
a^2. Pristiopsis. Subcaudal lobe present.
    d^1. Subcaudal lobe small; rostral teeth 17 to 22 each side; first dorsal inserted before ventral origin............................ **microdon**
    d^2. Subcaudal lobe prominent; rostral teeth 23 to 35 each side; first dorsal inserted behind ventral bases.......................... **cuspidatus**

Subgenus PRISTIS Linck

PRISTIS PECTINATUS Latham

Pristis pectinatus Latham, Trans. Zool. Soc. London, vol. 2, p. 278, pl. 26, fig. 2, 1794 (saw) (type locality: In the ocean).—Cuvier, Règne animal, vol. 2, p. 131, 1817 (reference).—Müller and Henle, Syst. Beschr. Plagiostomen, p. 109, 1841 (Cayenne).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 55, 1852 (reference); Nat. Tijdschr. Nederland. Indië, vol. 21, p. 166.

1860 (Cape of Good Hope).—Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 36, 1860 (Calcutta).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 475, pl. 9, fig. 3 (snout), 1865 (Haiti).—Günther, Cat. Fishes British Mus., vol. 8, p. 439, 1870 (West Indies, Mexico, Calcutta, Cape of Good Hope).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 673, 1871 (Koseir, Red Sea).—Day, Fishes of India, Suppl., p. 811, 1888.—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 14, 1888 (Red Sea).—Boulenger, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—Day, Fauna Brit. India, Fishes, vol. 1, p. 39, 1889 (Akyab).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—Elera, Cat. Fauna Filip., vol. 1, p. 618, 1895 (Luzon, Manila Bay, Laguna de Bay).—Annandale, Mem. Indian Mus., vol. 2, p. 7, 1909 (Ganges estuaries).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 262, 1913 (tropical and temperate seas).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—Robinson, Natal Fisher. Rep., p. 51, 1919.—Norman, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 320, 1922 (Natal).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 192 (Durban).—Tortonese, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, p. 11, 1935-36 (Mar Rosso).

Pristis pectinata Blainville, Faune Française, Poiss, p. 51, pl. 12, fig. 3, 1825 (our seas).

Squalus pectinatus Buchanan-Hamilton, Fishes of Ganges, pp. 5, 361, 1822.

Squalus pristis (not Linnaeus) Forskål, Descript. Animal., p. 101, 1775 (Djedda; Lohaja).—Bloch, Naturg. ausländ. Fische, vol. 1, p. 41, pl. (26) 120, 1785 (Europe).—Bonnaterre, Tableau encyclop. Ichth., p. 11, pl. 8, fig. 24, 1788 (Atlantic Ocean).—Lacépède, Hist. Nat. Poiss., vol. 1, p. 286, 1798 (North Atlantic; Africa); vol. 4, p. 684, 1802.

Pristis granulosa Schneider, Syst. Ichth. Bloch, p. 352, 1801 [type locality: Havana (on Parra)].

Pristis mississippiensis Rafinesque, Ichth. Ohiensis, p. 80, 1820 (type locality: Lower Mississippi).

Pristis megalodon Duméril, Hist. Nat. Elasmobr., vol. 1, p. 476, pl. 9, fig. 4, 1865 (no locality).

Pristis acutirostris Duméril, Hist. Nat. Elasmobr., vol. 1, p. 479, 1865 (type locality: Antilles).

Pristis occa Duméril, Hist. Nat. Elasmobr., vol. 1, p. 479, 1865 (no locality).

Pristis leptodon Duméril, Hist. Nat. Elasmobr., vol. 1, p. 480, 1865 (type locality: Red Sea).

Pristis brevirostris Duméril, Hist. Nat. Elasmobr., vol. 1, p. 480, 1865 (type locality: Réunion).

Pristis waermanni Fischer, Jahrb. Hamburg, vol. 1, p. 39, 1884 (type locality: West Africa).

Pristis annandalei Chaudhuri, Rec. Indian Mus., vol. 2, p. 391, figs., 1908 (Burma).—Annandale, Mem. Indian Mus., vol. 2, p. 8, pl. 5, fig. 4, 1909 (type).

Rostrum width basally 7 in its length, serrae 31+29, closer forward; eye 2⅘ in interorbital; mouth width 6½ in head, slightly less than interorbital; teeth 68 above, 70 below, in pavement; interorbital slightly convex medially. Spiracles and nostrils oblique.

Scales with simple ovoid crowns, larger ending in point behind.

First dorsal begins opposite first third of ventral base, equals second dorsal, which inserted little nearer subcaudal origin than hind edge of first dorsal; low lateral postventral keel; supracaudal lobe slightly more produced than subcaudal, latter with trace of lobe.

Above olive-buff, disk edges, pectoral and ventral edges, caudal lobe and hind body keels white, like under surface of body.

Red Sea, Arabia, Natal, South Africa, Reunion, Madagascar, India, Philippines. Also in the tropical Atlantic.

1 example. A.N.S.P. Durban beach, Natal. H. W. Bell Marley. Length, 734 mm.

PRISTIS ZIJSRON Bleeker

Pristis zijsron Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 2, p. (417) 442, 1851 (type locality: Bandjermassing, Borneo, in rivers); vol. 3, p. (409) 441, 1852 (Bandjermassing).—Whitley, Australian Mus. Mag., vol. 3, pt. 1, p. 21, 4 figs., 1927; Rec. Australian Mus., vol. 15, p. 289, 1927 (Manly; Paramatta River).

Pristis zysron Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 55, 1852 (Bandjermassing); Act. Soc. Sci. Indo-Néerl., vol. 2, No. 7, p. 9, 1859 (Amboina).—Günther, Cat. Fishes British Mus., vol. 8, p. 438, 1870 (Ceylon).—Day, Fishes of India, pt. 4, p. 729, pl. 91, fig. 2, 1878.—Macleay, Proc. Linn. Soc. New South Wales, vol. 5, p. 306, 1880 (Moreton Bay); vol. 6, p. 370, 1881 (Moreton Bay); Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 13, 1888 (Moreton Bay, Lake Macquarie, Queensland, Maryborough).—Day, Fauna British India, Fishes, vol. 1, p. 38, 1889 (Mekran and Sind coast).—Weber, Zool. Ergebn. Reise Niederland. Ost Indien, p. 458, 1894 (Borneo, Java and Ternate, fresh water).—Volz, Rev. Suisse Zool., vol. 12, p. 484, 1904 (Sakaranda. Sumatra).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 459 (Baram, Borneo).—Volz, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 239, 1907 (Padang and Langhat).—Stead, Fishes of Australia, p. 233, 1908 (New South Wales, Queensland).—Annandale, Mem. Indian Mus., vol. 2,, p. 8, 1909 (India).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 262, 1913 (India, East Indies, Ceylon, Borneo, Amboina).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8 (Mekran), p. 17, 1913 (Gwadar).—Ogilby, Mem. Queensland Mus., vol. 5, p. 83, 1916 (Queensland coast).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—McCulloch, Fishes of New South Wales, ed. 2, p. 10, pl. 2, fig. 28a, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (East Indies).—Chevey, Inst. Océanogr. Indochine, 19^e^ note, p. 7, 1932 (Cochin China; Camboge).

Pristis zisron Tirant, Service Océanogr. Pêches Indo-Chine, 6^e^ note, p. 71, 1929 (Cochin China).

Pristis dubius Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 56, pl. 4, fig. 11, 1852 (type locality: East Indies); Nat. Tijdschr. Nederland. Indië, vol. 5, p. 459, 1853 (Bandjermasing; Batavia); vol. 8, p. 393, 1855 (Amboina).

Rostrum long, teeth 23 to 27 on left side, 23 to 28 on right side (usually 26). Eye 2¾ to 3¼ in interorbital. Nostrils and spiracles inclined moderately. Shagreen denticles along median keels of back, anterior margins of dorsals and caudal above, pectorals, ventrals and along lateral keel of side of tail after ventrals, enlarged. Keel after first dorsal obsolete after ⅔ of space to second dorsal.

Origin of first dorsal little behind ventral origin, not larger than second dorsal. Subcaudal broadly rounded, without trace of lobe below. Pectoral with outer angle broadly rounded, hind edge convex, and hind angle not extended.

India, Ceylon, East Indies. Garman gives the rostral teeth 25 to 32, with hindmost farther apart. Two mounted examples, each about 4575 mm. long, from Moreton Bay, Queensland, seen in the Queensland Museum in 1929.

U.S.N.M. No. 59897. Clarence River, New South Wales. D. G. Stead.

8 examples. A.N.S.P. Baram, British North Borneo. 1898. Wistar Institute of Anatomy. Length, 404 to 580 mm.

PRISTIS CLAVATA Garman

Pristis clavata GARMAN, Bull. Mus. Comp. Zool., vol. 46, p. 208, 1906 (type locality: Queensland); Mem. Mus. Comp. Zool., vol. 36, p. 263, pl. 16, figs. 6–7, 1913 (type).—OGILBY, Mem. Queensland Mus., vol. 5, p. 84, 1916 (reference).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (reference).

Head to last gill opening nearly 2½ in total length; width at spiracles 3 in its length to spiracles. Snout 1⅙ in head measured to spiracles; eye 17, 15 in snout, 3⅕ in interorbital; rostral teeth 21+21, long, slender, rounded on each edge; mouth wide, slightly arched forward, 6 in preoral length, labial folds rudimentary; teeth very small, 78 rows above, 76 below, in pavement; nostrils wide, oblique, front valve with broad rounded median lobe, hind valve narrowly free behind, with outer division extended as partition into nostril in sort of flap below lobe of front valve, internarial greater than nostril width and over half space to mouth; interorbital 5⅛ in head to spiracles. Gill openings small, last smallest, outer edges of valves in sigmoid curves. Spiracle eye diameter behind eye, equals eye.

Scales very small, usually with wide base, peduncle stout and smooth depressed crown sharp angled posteriorly; at rostral end and under surface crown rounded, smooth, convex, sessile.

First dorsal origin over first third of ventral base, fin length 3⅙ in head measured to spiracle; second dorsal length 3½; caudal 6⅔ in rest of body, subcaudal not lobed, obliquely truncated; pectoral length 1⅗ in head measured to spiracle, width 2⅕ its length; ventral length 2⅘ in head.

Olivaceous brown, yellowish to greenish, darker on crown, fins lighter, ventral surfaces white. Length, 620 mm. (Garman.)

Queensland. The type, No. 733 in Museum of Comparative Zoology.

Subgenus PRISTIOPSIS Fowler

PRISTIS MICRODON Latham

Pristis microdon LATHAM, Trans. Linn. Soc. London, vol. 2, p. 280, pl. 26, fig. 4 (rostrum), 1794 (habitat ?).—SCHNEIDER, Syst. Ichth. Bloch, p. 351, 1801 (copied).—CUVIER, Règne animal, vol. 2, p. 132, 1817 (reference).—MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 107, 1841 (no locality).—GRAY, List fish British Museum, p. 90, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 54, 1852 (Batavia, Gresik and Suracarta, Java; Bandjermassing, Borneo); (Bengal), vol. 25, p. 80, 1853 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 265, pl. 55, fig. 3, pl. 64, figs. 2–3 (anatomy), 1913 (tropical seas, in rivers; Amazon and tributaries).—OGILBY, Mem. Queensland Mus., vol. 5, p. 84, 1916 (reference).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—HERRE, Philippine Journ. Sci., vol. 34, p. 303, 1927 (Lake Naujan, Mindoro).—FOWLER, Proc. 4th (1929) Pac. Sci. Congress, Java, p. 498, 1930 (reference).—CHEVEY, Inst. Océanogr. Indochine, 19ᵉ note, p. 6, 1932 (Cochinchina; Cambodge).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 15, 1937 (reference).

Pristis perotteti (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 108, 1841 [type locality: Senegal (fresh water)].—GRAY, List fish British Museum, p. 91, 1851 (reference).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 436, 1870 (Atlantic Ocean, West Indies, Chipam, Bandjermassing, Zanzibar).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (Madagascar).—WEBER, Zool. Ergebn. Reise Niederländ. Ost-Indien, p. 458, 1894 (Borneo and Sumatra, fresh water).—VOLZ, Zool. Jahrb., Abth. *in* von der Decken's Syst., vol. 19, p. 413, 1904 (Palembang; Bantung); Nat. Tijdschr. Nederland. Indië, vol. 66, p. 239, 1907 (Palembang).—PEARSON, Ceylon Administr. Rep., p. F9, 1915–18.—HERRE, Fishes Herre Philippine Exped. 1931, p. 12, 1934 (Laguna de Bay).

Pristis perrotetti MARTENS, *in* von der Decken's Reise Ost Afrika, vol. 3, pt. 1, 1859–61, p. 144, 1869 (Ebenda).—SUVATTI, Index Fish. Siam, p. 15, 1937 (Nonthaburi; Tha-cin; Rayong).

Pristis perrotteti DAY, Fishes of India, pt. 4, p. 729, pl. 191, fig. 1, 1878 (Mahanuddee River, Orissa).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 49, 1885 (Laguna de Bay, Luzon).—DAY, Fauna Brit. India, Fishes, vol. 1, p. 8, 1889.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Moratabas).—MALPAS, Ceylon Administr. Rep., p. E6, 1921.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 71, 175, 1929 (Cochinchina).

Pristis perottetii ANNANDALE, Mem. Indian Mus., vol. 2, p. 6, 1909 (off Arakan and Orissa).

Pristis perrottetti PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, No. 2, p. 352, 1929 (Travancore).

Pristis antiquorum (not Latham) BLYTH, Journ. Asiat. Soc. Bengal, vol. 29, p. 36, 1860 (Calcutta).—GUICHENOT, Notes ile Réunion, vol. 2, p. 30, 1863.

Pristis zysron (part) BLEEKER, Nat. Tijds. Nederland. Indië, vol. 3, p. 441, 1852.

Pristis zephyreus JORDAN and STARKS, Proc. California Acad. Sci., ser. 2, vol. 5, p. 383, 1895 (type locality: Panama).—OGILBY, Ann. Queensland Mus., No. 9, p. 4, 1908 (Queensland coast).

Head to spiracles 2⅗ to subcaudal origin; width at pectoral origin 2¾. Snout 1⅕ in head measured to spiracle; eye 20, 18 in snout, 3½ in interorbital; rostral teeth 17+17, well spaced, grooved behind to form 2 cutting edges, of which lower more prominent; jaw teeth in 70 rows above, 72 rows below, in pavement; interorbital 5½ in head to spiracle. Spiracles oblique, 1 to 1¼ diameters behind orbit, subequal with orbit.

First dorsal inserted before ventral origin or nearly opposite tips of depressed pectorals, fin length 3¼ in head to spiracle; second dorsal length 3⅗; caudal 5⅓ in rest of body, slight subcaudal lobe 2⅖ in caudal length; pectoral length 2 in head measured to spiracle, width 1⅞ its length; ventral length 4⅖ in head to spiracle.

Reddish brown above, dull white on abdominal surface. Iris golden, with black edge. Reaches 4,575 mm. (Day; Garman.)

Zanzibar, Madagascar, Réunion, India, East Indies, Indo-China, Queensland. Also in the tropical Atlantic. Enters tidal water where fresh.

PRISTIS CUSPIDATUS Latham

Pristis cuspidatus Latham, Trans. Linn. Soc. London, vol. 2, p. 279, pl. 26, fig. 3 (rostrum) 1794 (habitat ?).—Cuvier, Règne animal, vol. 2, p. 131, 1817 (reference).—Müller and Henle, Syst. Beschr. Plagiostomen, p. 107, 1841 (Sumatra).—Gray, List. fish British Museum, p. 90, 1851 (Tenasserim).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 55, 1852 (name).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 476, 1865 (no locality).—Günther, Cat. Fishes British Mus., vol. 8, p. 439, 1870 (Pinang, India, East Indies, Tenasserim, Bengal).—Day, Fishes of India, pt. 4, p. 728, pl. 191, fig. 3, 1878 (Calicut and Madras).—Ogilby, Cat. Fishes Australian Mus., vol. 1, p. 14, 1888 (Madras).—Day, Fauna Brit. India, Fishes, vol. 1, p. 37, fig. 15, 1889.—Bartlett, Sarawak Gaz., vol. 26, No. 366, p. 134, 1896 (Santubong and Moratabas).—Johnstone, Fasc. Malayensis, Annandale and Robinson, Zool., pt. 2, p. 302, 1903 (Patani and Jhering coasts).—Duncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, (1903) p. 192, 1904 (Kuala Lamgat).—Volz, Rev. Suisse, Zool., vol. 12, p. 484, 1904 (Chalipah Bedager; Wampu R.); Nat. Tijdschr. Nederland. Indië, vol. 66, p. 239, 1907 (Padang and Laughat).—Annandale, Mem. Indian Mus., vol. 2, p. 5, 1909 (off Orissa and Ganges mouth).—Southwell, Spolia Zeylanica, vol. 6, pt. 24, p. 137, 1910 (with intrauterine embryos); Ceylon Administr. Rep., pp. E42, E44, E48, E49, 1912–13.—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 261, 1913 (India, Red Sea, East Indies).—Pearson, Ceylon Administr. Rep., p. E23, 1914 (Trincomalee); p. F13, 1915–18; pp. F26, F28, 1926.—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 101, 1928 (Bombay).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 352, 1929 (Travancore).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 71, 1929 (Cochinchina).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (Indian Ocean); Hong Kong Nat., vol. 1, p. 131, fig. 14, 1930 (Indian Ocean).—Chevey, Inst. Océanogr. Indochine, 19ᵉ note, p. 7, 1932 (Indochina).—Wang, Contrib. Biol. Lab. Sci. Soc. China, vol. 9, p. 96, fig. 3, 1933 (Yenting).—Suvatti, Index Fish. Siam, p. 3, 1937 (Gulf of Siam).—Fowler, List Fish. Malaya, p. 11, 1938 (reference).—Giltay, Mem. Mus. Roy. Nat. Hist. Belg., ser. 5, vol. 3, p. 12, 1933 (Tandjong Priok).

Pristis cuspidata Schneider, Syst. Ichth. Bloch, p. 351, 1801 (on Latham).—Van Hasselt, Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824 (Java).—Lloyd, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).

Squalus semisagittatus Shaw, General zoology, vol. 5, p. 361, 1804 (type locality: Indian Seas). (On *Yahla* Russell, Fishes of Coromandel, vol. 1, p. 8, pl. 13, 1803 (Vizagapatam).

Pristis semisagittatus Swainson, Nat. Hist. Animals, vol. 2, p. 319, 1839 (on Russell).—Müller and Henle, Syst. Beschr. Plagiostomen, p. 108, pl. 40 mouth), 1841 (Coromandel, Mediterranean).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1389, 1849 (Pinang, Singapore, Malay Peninsula).—Gray, List fish British Mus., p. 91, 1851 (India).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 53, 1852 (Batavia and Samarang); (Bengal), vol. 25, p. 9, 1853 (reference).—Day, Fishes of Malabar, p. 272, 1865.

Pristis semi-sagittatus Duméril, Hist. Nat. Elasmobr., vol. 1, p. 477, pl. 9, figs. 6–6a (saw), 1865 (Mer des Indes).

? *Pristobatus emarginatus* Blainville, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816 (name only).

Depth 11¾ to subcaudal origin; head 2⅖, width at front of spiracles 4⅓. Rostrum long, slender, tapers very gradually, teeth 23+24, narrowly triangular, with inner subbasal barb, not extending on basal fourth of rostrum; eye 2⅞ in interorbital; mouth width slightly greater than interorbital or 6⅕ in head; teeth in 62 rows; nostril oblique, larger than eye, 2⅗ in interorbital; interorbital with superciliary regions little convex, higher than broad median convexity, width 6½ in head.

Skin smooth.

First dorsal inserted behind ventral base, long as high or 4 in head; second dorsal little higher than long, 4⅒ in head; subcaudal 1½ in caudal, which 2⅘ in head; caudal peduncle depth ⅔ its width which 2⅕ in interorbital; pectoral 3⅕ in head, long as wide; ventral 3⅞.

Dark drab or neutral gray above, below whitish. Borders of fins and lateral fold of tail whitish. Iris dark gray. Rostral teeth all pale.

Red Sea, India, Ceylon, Malay Peninsula, Pinang, East Indies, Cochin China.

1 example. A.N.S.P. Bombay. Dr. F. Hallberg. Length, 615 mm.

Family RHINOBATIDAE

Body depressed, sharklike, disk passing gradually into long, strong, depressed tail. Disk tapers forward, wide behind. Snout produced, not toothed on edges. Orbit with fold below eye and projecting shield above pupil. Teeth in pavement, small, numerous. Nostrils oblique, each valve in three sections, an outer and an inner separated by elongate lobe. Spiracle large, close to eye. Skin nearly smooth or with warty tubercles, without conspicuous spines. No electric organs. Dorsals two, well developed. Caudal moderate or small. Conspicuous dermal fold along each side of tail. Rayed parts of pectorals not reaching snout, continued opposite gill openings.

Sharklike rays of warm seas, typically with an elongated body. Ovoviviparous. Fossils known from the Cretaceous and later deposits.

ANALYSIS OF GENERA

a^1. RHININAE. First dorsal origin above, before or immediately behind ventrals, which placed well behind pectorals; subcaudal well developed; pectoral not extending forward beyond level of mouth.
  b^1. Snout broad, rounded; mouth deeply undulated; nostril length less than internarial width; no spiracular folds____________ **Rhina**
  b^2. Snout elongate, narrow, pointed; mouth not deeply undulated; nostril length greater than internarial width; 2 spiracular folds_ **Rhynchobatus**
a^2. RHINOBATINAE. First dorsal origin well behind ventrals; no distinct subcaudal; pectorals extend forward beyond level of mouth, well separated anteriorly.
  c^1. Front nasal valves not united to form quadrangular flap.
    d^1. Nostrils oblique or occasionally nearly transverse; inward extension of front nasal valve ends on or crossing front margin of nostril; 1 or 2 spiracular folds____________ **Rhinobatos**
    d^2. Nostrils nearly transverse; inward extension of front nasal valve crosses inner angle of nostrils____________ **Aptychotrema**
  c^2. Front nasal valve united to form quadrangular flap; snout short, obtusely pointed____________ **Trygonorrhina**

Genus RHINA Schneider

Rhina SCHNEIDER, Syst. Ichth. Bloch, p. 352, 1801. (Type, *Rhina ancylostomus* Schneider, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 59, 1917. *Rhina* Schaffer 1760, Walbaum 1792, inadmissible, therefore not preoccupying *Rhina* Schneider.)

Demiurga GISTEL, Naturg. Thierreichs, p. x, 1848. (Type, *Rhina ancylostomus* Schneider, virtually. *Demiurga* Gistel proposed to replace *Rhina* Schneider.)

Rhamphobatis GILL, Ann. Lyceum Nat. Hist. New York, vol. 7, p. 408, 1862. (Type, *Rhina ancylostomus* Schneider, virtually. *Rhamphobatis* Gill proposed to replace *Rhina* Schneider.)

Body depressed. Tail depressed, nearly half total length, slender, continuous with body and pectorals. Body and head, also pectorals, united as subtriangular disk, about one-third total length. Snout broad, blunt, rounded. Mouth arched forward, deeply undulated. Teeth larger on prominences. Nostrils nearly transverse, length of each less than internarial width. Spiracles large, without folds. Scales small, tubercles large and compressed. First dorsal above ventrals. Caudal axis raised in fins, subcaudal lobed. Ventrals remote from pectorals.

Indo-Pacific.

RHINA ANCYLOSTOMA Schneider

Rhina ancylostomus SCHNEIDER, Syst. Ichth. Bloch, p. 352, pl. 72, 1801 (type locality: Coromandel; Indian Sea).—CUVIER, Règne animal, vol. 2, p. 133, 1817 (copied).—GRAY, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 102, fig. 2, 1832–34 (India).—AGASSIZ, Poissons fossiles, vol. 3, p. 82, pl. 4, figs. 3–4, 1835.—MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 110, 1841 (locality unknown).—RICHARDSON, Fishes China Japan, p. 195, 1846 (Seas of China).—CANTOR, Journ. Asiat. Soc. Bengal, vol. 18, pt. 2, p. 1391, 1849 (Pinang).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 148, 1851.—GRAY, List fish British Mus., p. 92, 1851 (Madras, China, Pinang).

Rhina anchylostoma VAN HASSELT, Algemein Konst. Letterbode, p. —, 1823 (Java).; Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824 (Java).

Rhina ancylostoma BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, pp. 51, 56, 1852 (Batavia); (Bengal), vol. 25, p. 16, 1853 (reference).—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, p. 11, 1935–36 (Baia de Assab, Mar Rosso).—FOWLER, List Fish. Malaya, p. 13 (246), 1938 (reference).

Rhamphobatis ancylostomus DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 482, 1865 (compiled).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 10, pl. 5, fig. 5, 1909 (Off Orissa and Hughli River mouth).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 267, 1913 (Africa, China, East Indies).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (reference); Hong Kong Nat., vol. 1, p. 132, fig. 15, 1930 (compiled).—CHEVEY, Inst. Océanogr. Indochine, 19ᵉ note, p. 7, 1932 (Cochinchina).—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 43, p. 233, 1933 (Baia de Assab).

Rhamphobatis ancylostoma JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 643, 1903 (Kinkwazan).—OGILBY, Ann. Queensland Mus., no. 9, p. 6, 1908 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 84, 1916 (Moreton Bay and Dunk Island).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—NORMAN, Proc. Zool. Soc. London, p. 943, text fig. A (nostril), 1926 (East Africa, Red Sea, Indian Ocean, Indian Archipelago, Australia, Japan).

Rhynchobatus ancylostomus GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 440, 1870 (Madras, China, Seychelles, Pinang).—DAY, Fishes of India, pt. 4, p. 730, pl. 193, fig. 3, 1878 (Madras); Fauna British India, Fishes, vol. 1, p. 41, 1889.—BOULENGER, Proc. Zool. Soc. London, p. 136, 1892 (Muscat).—KENT, Great Barrier Reef, p. 305, 1893 (Queensland).—ELERA, Cat. Fauna Filip., vol. 1, p. 169, 1893 (Luzon, Cavite, Santa Cruz).—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (lower Sarawak River).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—PEARSON, Ceylon Administr. Rep. 1914, p. E4.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 72, 1929 (Cochinchina).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 351, 1929 (Travancore).

Rhynchobatus anchylostomus PEARSON, Ceylon Administr. Rep., 1915–18, pp. F9, F14, F18.

Rhina cyclostomus SWAINSON, Nat. Hist. Animals, vol. 2, p. 322, 1839 (on Schneider).

Head measured to spiracle 4⅘ to subcaudal origin, disk length 1⅓ its width. Snout 1⅓ in head to spiracle, broadly convex in front, rostral cartilages short; eye 6½, 5 in snout, 3⅔ in interorbital; dentary width 1⅞, equals preoral length; teeth in 77 to 75 rows, median 22 upper and 27 lower vertical rows, largest on summits of 3 elevations in each jaw, obtusely rounded and each with several longitudinal ridges; nostrils twice eye, 1½ in internarial which 1⅕ in mouth width; nasal valves weak, short; interorbital 1⅘ in head to spiracle, slightly concave. Spiracle 1½ eye diameters behind eye, equals eye, without folds.

Irregular row of large tubercles from ridges above each eye to nape, vertebral row before first dorsal, 2 parallel rows each side above pectoral base of which inner partly continuous with supraorbital row.

First dorsal origin about over ventral origin, fin length 1⅒ in head to spiracle; second dorsal length 1¼; caudal 5¼ in rest of body, subcaudal 1¾ upper caudal lobe; pectoral broadly angular, hind truncate edge equals head to spiracle; ventral about 1½.

Dull brown, lighter below. Body and sometimes fins covered with whitish dots. Occasionally some tortuous black lines. Length 2,084 mm. (Day.)

Red Sea, Arabia, East Africa, Seychelles, India, Ceylon, Pinang, East Indies, Philippines, Cochin China, China, Japan, Queensland.

Genus RHYNCHOBATUS Müller and Henle

Rhynchobatus Müller and Henle, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 116. (Type, *Rhinobatus laevis* Schneider, monotypic.)

Rhynchobatis Müller and Henle, Syst. Beschr. Plagiostomen, p. 111, 1841. (Type, *Rhinobatus laevis* Schneider, monotypic.)

Disk partly triangular, longer than wide. Tail with axis somewhat raised. Snout elongated, narrow, pointed, length much greater than interorbital, not extended beyond nostrils. Teeth obtuse, pavement-like, dental surfaces undulated. Nostril length greater than internarial width. Spiracle with two very small folds on hind edge. Median row of tubercles directed backward, from nape to first dorsal and between first and second dorsals; another partly median row on each shoulder and row above each orbit. First dorsal opposite ventrals. Caudal keels weak, lower lobe well developed. Front pectoral edge free.

Large rays of the Indian Ocean and western Pacific and in South Africa of some interest to anglers. A second species on West African coasts. They differ from *Rhina* in the produced snout, like that of *Rhinobatos*.

RHYNCHOBATUS DJIDDENSIS (Forskål)

Raja djiddensis Forskål, Descript. Animal., pp. VIII, 18, 1775 (type locality: Djedda and Lohaja, Red Sea).—Gmelin, Syst. Nat. Linn., vol. 1, p. 1511, 1789 (Red Sea).—Walbaum, Artedi Pisc., vol. 3, p. 534, 1792 (copied).—Lacépède, Hist. Nat. Poiss, vol. 1, p. 135, 1798 (copied).—Shaw, General Zool., vol. 5, p. 319, 1804.

Raia djiddensis Bonnaterre, Tableau Encyclop. Ichth., p. 5, 1788 (Red Sea).

Rhinobatus djiddsensis Schneider, Syst. Ichth. Bloch, p. 356, 1801 (Red Sea),

Rhinobatus djiddensis Cuvier, Règne Animal, vol. 2, p. 133, 1817 (reference).—Bennett, Life of Raffles, p. 694, 1830 (Sumatra).

Rhinobatus djeddensis Rüppell, Atlas Reise Nördl. Afrika, Fische, p. 54, pl. 14, fig. 1, 1828 (Red Sea).—Bennett, Life of Raffles, p. 693, 1830 (Sumatra).—Borodin, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (Philippine Islands).

Rhinobatus djettensis Rüppell, Neue Wirbelth., Fische, p. 68, 1835 (reference).

Rhinobatis djeddensis Annandale, Mem. Indian Mus., vol. 2, p. 12, 1909 (Bengal Bay).

Rhynchobatus djeddensis Cantor, Journ. Asiatic Soc. Bengal, vol. 18, pt. 2, p. 1394, 1849 (Pinang, Malay Peninsula, Singapore).—Jerdon, Madras Journ. Lit. Sci., vol. 17, p. 148, 1851.—Günther, Cat. Fishes British Mus., vol. 8, p. 441, 1870 (Red Sea, Zanzibar, Seychelles, Sumatra, East Indies, India).—Day, Proc. Zool. Soc. London, p. 704, 1870 (Andamans); Fishes of India, pt. 4, p. 730, pl. 192, fig. 1, 1878 (Coromandel Coast).—Meyer, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 49, 1885 (Macassar).—Boulenger, Proc. Zool. Soc. London, p. 243, 1889 (Muscat).—Day, Fauna British India, Fishes, vol. 1, p. 40, fig. 16, 1889.—Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 4, p. 181, 1889 (Port Jackson).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—Elera, Cat. Fauna Filip., vol. 1, p. 619, 1895 (Samar, Luzon, Santa Cruz, Cavite).—Bartlett, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Moratabas).—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 41, 1901 (Nagasaki).—Duncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 193, 1904 (Kuala Langat).—Volz, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 239, 1907 (Sumatra?).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 58, 1925 (on Robinson).—Fowler, Mem. Bishop Mus., vol. 10, p. 24, 1928 (compiled).—Tirant, Service Océanogr. Pêches Indo-Chine, 6e note, p. 72, 1929 (Cochin China).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 352, 1929 (Travancore).—Tortonese, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, No. 63, p. 11, 1935–36 (Mar Rosso; Baia di Assab).

Rhyncobatus djeddensis Day, Fishes of Malabar, p. 273, 1865.

Rynchobatus djeddensis Ogilby, Proc. Linn. Soc. New South Wales, vol. 10, p. 465, 1885 (Port Jackson); Cat. Fish. Australian Mus., pt. 1, p. 13, 1888 (Port Jackson; Madras).—Günther, Journ. Mus. Godeffroy, pt. 17, p. 491, 1910 ("Woodlark Island").

Rhynochobatus djeddensis Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (East Indies, Japan). (Error.)

Rhynchobatis djeddensis Malpas, Ceylon Adminstr. Rep., 1921, p. E8.

Rhynchobatus djiddensis Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 674, 1871 (Koseir, Red Sea).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 644, 1903 (Tsuruga, Japan).—Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang).—Jordan and Seale, Bull. Bur. Fisher,, vol. 26 (1906), p. 4, 1907 (Cavite).—Ogilby, Ann. Queensland Mus., No. 9, p. 5, 1908 (Queensland coast).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, p. 469, 1910 (Padang example).—Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 588, 1912 (Batavia).—Pearson, Ceylon Administr. Rep., 1912–13, p. E6.—Southwell, Ceylon Adminstr. Rep., pp. E43, E44, E46, E49, 1912–13.—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 268, 1913 (Red Sea, East Indies, Africa, India).—Weber, *Siboga* Exped., Fische, vol. 57, p. 597, 1913 (Makassar).—Pearson, Ceylon Adminstr. Rep. 1914, p. E4; 1915–1918, pp. F9, F11, F13, F16.—Ogilby, Mem. Queensland Mus., vol. 5, p. 84, 1916 (Moreton Bay, Cartwright Point, Nor-West Islet).—Malpas, Ceylon Administr. Rep., 1922, p. F6.—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—Chabanaud, Service Océanogr. Pêches Indo-Chine, 1^{e} note, p. 5, 1926 (Indochina).—Norman, Proc. Zool. Soc. London, 1926, p. 944, text fig. B (nostril) (East Africa; Red Sea; Pacific).—McCulloch, Biol. Res. *Endeavour*, vol. 5, pt. 4, p. 157, 1926 (Queensland); Fishes of New South Wales, ed. 2, p. 10, pl. 2, fig. 29, 1927; Australian Mus. Mem., vol. 5, p. 23, 1929 (Queensland; New South Wales).—Herre, Fishes Herre Philippine Exped. 1931, p. 12, 1934 (Manila).—Roxas and Martin, Depart. Agri. Comm. Manila Tech. Bull. 6, p. 16, 1937 (reference).—Suvatti, Index Fish. Siam, p. 4, 1937 (Gulf of Siam; Maenam Canthaburi; Trat).—Fowler, List Fish. Malaya, p. 14 (246), 1938 (reference).

Rhynchobatis djiddensis Fowler, Copeia, No. 58, p. 62, 1918 (Philippines).

Rhinobatus laevis Schneider, Syst. Ichth. Bloch, p. 354, pl. 71, 1801 (type locality: Tranquebar).—Van Hasselt, Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824 (Java).—Schlegel, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 306, pl. 139 (not 129 as in text), 1850 (Japan).

Rhinobates laevis Swainson, Nat. Hist. Animals, vol. 2, p. 322, 1839 (on *Walawah tenkee* Russell, Fishes of Coromandel, vol. 1, p. 6, pl. 10, 1803, Visagapatam).

Rhynchobatus laevis Müller and Henle, Syst. Beschr. Plagiostomen, p. 111, 1841 (India, Red Sea, Malabar).—Gray, List fish British Museum, p. 92, 1851 (Indian Seas ?, Red Sea, India).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, pp. 51, 58, 1852 (Batavia and Samarang); (Japan), vol. 25, p. 22, 1853 (Japan, East Indies, Malacca, India, Red Sea); (Bengal), vol. 25, pp. 9, 82, 1853 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 483, 1865 (Malabar, Pondicherry, mer des Indes, Red Sea).—Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 60, p. 571, 1870 (Singapore).

? *Rhinobatus laevissimus* Blainville, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816 (name only).

? *Rhinobatis duhameli* Blainville, Faune Française, Poiss., p. 48, pl. 11, figs. 1–2, 1825 (no locality).

Rhinobates rüppellii Swainson, Nat. Hist. Animals, vol. 1, p. 185, fig. 24, 1838 (no locality).

Rhinobatus jaram Montrouzier, Ann. Soc. Agric. Hist. Nat. Lyon, p. 220, 1856 (type locality: Woodlark Island, Louisiades).

? *Rhinobatus thouini* (not Lacépède) Károli, Termész. Füzetek, Budapest, vol. 5, p. 148, 1881 (Japan).

Rhinobatus columnae (not Bonaparte) Robinson, Natal Fisher. Rep., p. 50, 1919 (Natal).

Depth 10 to 11⅖ to subcaudal origin; head 2⅕ to 2⅞; disk width 1⅓ to 1⅖ in its length. Snout 1⅗ in head; eye 9⅖ to 10⅗, 7 to 7⅕ in snout, 3⅗ to 3⅘ in interorbital; dentary width 3⅞ to 4⅓ in head, with short upper and lower labial fold at each angle; teeth in 40 rows in each jaw, smooth, rhomboid; nostrils large, wide, oblique, narrower and slightly curved back toward mouth on inner ends, each nearly ⅞ dentary width, little greater than internarial, valves feeble, with short interior lobe; interorbital 3⅕ to 3⅖ in head, slightly depressed concavely. Gill openings nearly equidistant, short. Spiracles close behind eye and subequal, hind edge with 2 folds.

Row of small tubercles along each supraorbital edge, interrupted by division of spiracle. Median row of small vertebral tubercles down back, also short series on each shoulder, broken midway in its length.

First dorsal origin over ventral origin, front edge 2 in head, with long narrow point behind; second dorsal inserted nearer caudal origin than first dorsal orgin, front edge $2\frac{1}{3}$ to $2\frac{3}{5}$ in head, with long, narrow point behind; caudal axis slightly elevated; supracaudal pointed, $1\frac{4}{5}$ to $1\frac{7}{8}$ in head, subcaudal $1\frac{1}{2}$ in supracaudal; pectoral not reaching forward opposite nostrils; ventral length $2\frac{1}{8}$ to $2\frac{1}{5}$ in head.

Above gray, with obscure small white spots scattered about, surrounding round blackish spot less than eye in size, which above each end of shoulder girdle. Under surfaces uniform gray white.

Red Sea, Arabia, Zanzibar, Madagascar, Natal, Seychelles, India, Ceylon, Andamans, Pinang, Malay Peninsula, Singapore, East Indies, Philippines. Cochinchina, Japan, Melanesia, Queensland, New South Wales.

4528. Manila market. December 18, 1907. Length, 443 mm.

5250. Manila market. March 20, 1908. Length, 517 mm.

6728. Manila market. December 5, 1908. Length, 770 mm.

U.S.N.M. No. 72480. Batavia Java. Bryant and Palmer. Length, 590 mm.

U.S.N.M. No. 51356. Tsuruga, Japan. Jordan and Snyder. Head and part of pectoral fin, 510 mm.

U.S.N.M. No. 29019. Port Jackson. Australian Museum. Specimen skinned out, 1,500 mm.

A.N.S.P. No. 25125. Padang, Sumatra. A. C. Harrison and H. M. Hiller. Length, 734 mm. Color in arrack gray above, tinted with very pale olivaceous. Disk edges above, ventrals and lateral edges of caudal peduncle and trunk whitish like under surface of body. Large round jet-black spot little less than eye at each pectoral base. About eyes, black pectoral spot and on hind basal portion of pectoral, together with upper trunk sides opposite first dorsal, number of small white spots about size of pupil, each edged with pale slaty. Several dark spots on snout below anteriorly.

RHYNCHOBATUS YENTINENSIS Wang

Rhynchobatus yentinensis WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, No. 3, p. 98, fig. 4, 1933 (type locality: Wenchow).

Body elongate, depressed throughout. Head rather large, pointed, much depressed, width much greater than depth. Snout long, pointed, tip acutely rounded, twice or more longer than interorbital width; eye superior, above and in front of mouth angle, much nearer first gill opening than snout tip; mouth inferior, moderate, slightly undulated, much nearer hind gill opening than snout tip; teeth oval, very obtusely rounded, some with central cusp, alike in both jaws, in 27 rows; nostrils large, inner end obliquely inclined above mouth angles, internasal space nearly equals nostril length or slightly narrower; interorbital rather broad, more or less flattened, with ridge provided by series of obtuse spines on front and upper edge of orbit. Gill openings 5, inferior, last one slightly smaller. Spiracles smaller than eye, short space posterior, with 2 distinct valves on inner hind edge.

Skin finely roughened. Series of obtuse spines on middle line of back from occiput to second dorsal origin, those between dorsals much smaller. Two pairs of spines and another single one on each side of shoulder girdle, another series of spines on supraorbital ridges as above mentioned. Each side of tail with cutaneous fold, more prominent posteriorly.

First dorsal inserted above or slightly behind ventral origin with hind edge concave and lower angle acute; second dorsal inserted at hind third of space between first dorsal origin and caudal base, like first dorsal only slightly smaller. No anal. Caudal gently bent up, subcaudal well developed, separated from supracaudal by deep notch. Pectoral edge behind straight, inner angle acute. Ventral far separated from pectoral, interspace much greater than ventral base. Clasper slender.

Gray brown above, dirty white below. Lateral whitish horizontal band from hind edge of pectoral to caudal base. Back between dorsals with 2 series of white spots. Dark spot on shoulder girdle. Dark oblong spot on eye immediately before spiracle. Dusky spot on side of snout not far from tip.

Length to last vertebra, 1,010 mm. (Wang.)

China. Differs from *Rhynchobatus djiddensis* in dentition and color. Second dorsal more posteriorly inserted and first dorsal advanced.

Genus RHINOBATOS Linck

Rhinobatos Linck, Mag. Phys. Naturg. Gotha, ser. 3, vol. 6 p. 32, 1790. (Atypic. Type, *Raja rhinobatos* Linnaeus, assumed tautotype.)

Rhinobatus (Klein) Walbaum, Artedi Pisc., vol. 3, p. 581, 1792. (Atypic. Type, *Raja rhinobatos* Linnaeus, assumed tautotype.) (Inadmissible.)—Schneider, Syst. Ichth. Bloch, p. 353, 1801. (Type, *Raja rhinobatos* Linnaeus, tautotypic.)

Rhinobatis Blainville, Faune Française, Poissons, p. 47, 1825. (Type, *Raja rhinobatos* Linnaeus.)

Rhinobates Swainson, Nat. Hist. Animals, vol. 2, p. 193, 1839. (Type, *Raja rhinobatos* Linnaeus).

Leiobatus Rafinesque, Caratteri nuovi animali piante Sicilia, p. 16, 1810. (Type, *Leiobatus panduratus* Rafinesque, monotypic.) (Not precluded by *Leiobatus* Klein.)

Leiobatis Blainville, Faune Française, Poissons, p. 43, 1825. (Type, *Leiobatus panduratus* Rafinesque.)

Squatinoraja Nardo, Osservazioni ed aggiunte all' Adriaticae ittiologia . . ., 1824. (Type, *Squatinoraja colonna*=*Rhinobatus columnae* Müller and Henle.)

Aellopos Münster, Neues Jahrb. Mineral., p. 581, 1836. (Type, *Aellopos elongatus* Münster.)

Euryarthra Agassiz, Poissons fossiles, vol. 3, p. 382, 1843. (Type, *Euryarthra munsteri* Agassiz.)

Glaucostegus Bonaparte, Cat. Metod. Pesci Europei, p. 14, 1846. (Type, *Rhinobatus cemiculus* Geoffroy Saint Hilaire=*Raja rhinobatos* Linnaeus.)

Spathobatis Thiollière, Ann. Soc. Agric. Hist. Nat. Lyon, ser. 2, vol. 1, p. 63, 1849. (Type, *Spathobatis bugesiacus* Thiollière.)

Body depressed, gradually passing into tail. Tail depressed, robust anteriorly. Disk partly triangular, rounded and wider behind. Snout elongate, pointed, formed by long rostral cartilage and vascular area each side. Teeth obtuse, with indistinct transverse ridge. Nostrils oblique, wide, front valves not confluent and not reaching mouth. Spiracles wide, behind eye, mostly with two folds on hind edge, rarely with one or none. Dorsals spineless, both behind ventrals. Caudal small, subcaudal part weak and without lobe. Pectorals rather narrow, best developed behind shoulder girdle, narrowed to acute in front, not extended into snout. Ventrals close to pectorals. Claspers slender, pointed.

Species numerous in warm seas, and vary greatly in the form of the snout.

Rhinobatos dumerilii Castelnau[7] is an imperfectly described and doubtful species.

Rhinobatos is the original way of spelling the name for this genus and is so accepted here.

ANALYSIS OF SPECIES

a^1. Leiobatus. Front nasal valve extends inward to some extent on internarial space.

b^1. Front nasal valve not extending inward much beyond level of inner nostril edge, not nearly reaching that of opposite side.

c^1. Snout rather long; mouth width 3⅓ to 3⅔ in snout; space between spiracles 2⅚ to 3¼ in snout.

d^1. Rostral ridges widely separated throughout their length; nostril length 1⅘ times internarial; blunt tubercles down median line of back. **holcorhynchus**

d^2. Rostral ridges approximated or narrowly separated anteriorly; nostril length 1⅓ to 1½ times internarial; tubercles in median line of back very small or rudimentary.

e^1. Rostral ridges more or less separated throughout their length, approximated only at snout end; horizontal distance from outer nostril edge to lateral snout edge little less than nostril length. **formosensis**

e^2. Rostral ridges more or less approximated in front ⅔ their length; horizontal distance from outer nostril edge to lateral snout edge greater than nostril length........................... **schlegelii**

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[7] Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 148, 1873 (type locality: Western Australia).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 372, 1881 (copied).

c^2. Snout short; mouth width 2⅓ to 3 in preoral length; space between spiracles 2⅓ to nearly 3 in snout; first dorsal base less than 3 times in interdorsal.

f^1. Mouth width 2⅓ to 2½ in snout; both spiracular folds well developed.

g^1. Space between rostral ridges rather narrow; series of spines in median line of back; first dorsal base 2¼ to 2⅖ in interdorsal. **annandalei**

g^2. Space between rostral ridges broader; series of minute tubercles in median line of back; first dorsal base 2⅘ in interdorsal. **lionotus**

f^2. Mouth width 2⅘ to 3 in snout; inner spiracular fold small or rudimentary; rostral ridges rather broad, narrowly separated anteriorly; median line of tubercles on back rudimentary. **hynnicephalus**

b^2. Front nasal valves extend inward well beyond level of inner nostril edge, nearly meets that of opposite side.

h^1. Both spiracular folds developed; mouth width 2½ to 3½ in preoral length.

i^1. Nostril length about equals internarial; space between spiracles 2 to 2⅗ in snout.

j^1. Mouth width 2¾ to 3 in preoral length; horizontal distance from outer edge of nostril to lateral snout edge 3 to 3⅔ in preoral length; back with dark annular ocelli. **annulatus**

j^2. Mouth width 2½ to 2⅗ in preoral length; horizontal distance from outer edge of nostril to lateral snout edge 2½ to 2¾ in preoral length; snout and pectoral fins with pale bluish gray spots and blotches-- **leucospilus**

i^2. Nostril length 1½ times internarial; space between spiracles nearly 3 times in snout.

k^1. Mouth width 3 in preoral length, 7½ in space from snout tip to front edge of vent; horizontal distance from outer nostril edge to lateral snout edge more than four in preoral length; coloration uniform. **zanzibarensis**

k^2. Mouth width 3½ in preoral length, more than 8 in space from snout tip to front edge of vent; horizontal distance from outer nostril edge to lateral snout edge 3⅗ in preoral length; back with numerous bluish gray ocelli------------------------------------ **ocellatus**

h^2. Only outer spiracular fold developed; mouth width 2¼ to 2⅖ in preoral length---------------------------------- **blochii**

a^2. RHINOBATOS. Front nasal valve extends inward on internarial space.

l^1. Nostril length nearly 2 or 3 in mouth width, about equals internarial.

m^1. Snout very long, narrow, nostril ridges approximated for greater part their length; mouth width 2⅔ to 3¼ in snout---------------- **granulatus**

m^2. Snout short, broad, rostral ridges more or less separated throughout their length; mouth width 1⅚ in snout---------------------------- **obtusus**

l^2. Nostril length less twice mouth width, greater than internarial.
    n^1. Snout expanded at tip; nostril length 1¼ in mouth width, nearly twice internarial. thouin
    n^2. Snout not expanded terminally.
        o^1. Nostril length nearly equals mouth width, which 2¼ to 2⅖ times internarial__ typus
        o^2. Nostril length 1½ to 1⅓ in mouth width, which 1⅓ to 1⅗ times internarial__ halavi

Subgenus LEIOBATUS Rafinesque

RHINOBATOS HOLCORHYNCHUS Norman

Rhinobatus holcorhynchus NORMAN, Ann. Mag. Nat. Hist. London, ser. 9, vol. 9, p. 318, 1922 (type locality: Natal).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 61, fig. 9c (mouth and nostrils), pl. 3, fig. 7, 1925 (Natal and Zululand).—NORMAN, Proc. Zool. Soc. London, 1926, p. 957, fig. 10 (rostra) (type).—BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 1014, 1927 (note).

Rhinobatus natalensis FOWLER, Ann. Natal Mus., vol. 5, pt. 2, p. 195, fig. 1, 1925 (type locality: Natal).

Rhinobatus rasus (not Garman) FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 192 (type of *Rhinobatus natalensis*).

Head to first gill opening 4⅛ in total length. Snout 5⅘ in head; eye 5⅙, 2 in interorbital; mouth width 3⅞ in head, nearly straight; nostril 5¼; antero-nasal space 2½, front nasal lobe feeble, extends halfway in nostril length, hind valve ⅔ in nostril length; preoral length 5 in total body length; interorbital 3⅕ in head, crown depressed, level, edges but slightly raised. Spiracle ¾ of eye, with prominent outer fold, inner small.

First dorsal length 2½ in head; second dorsal length 2¾; caudal 2; pectorals form disk width 1⅓ in its length or 3 in total length.

Slightly darker cloudings of brown down middle of back.

Natal, Zululand.

1 example. A.N.S.P. Natal Bluff, in 100 fathoms. H. W. Bell Marley. Length, 294 mm. Type of *Rhinobatus natalensis*.

RHINOBATOS FORMOSENSIS Norman

Rhinobatus formosensis NORMAN, Proc. Zool. Soc. London, 1926, p. 958, fig. 11 (rostra) (type locality: Formosa).

Rhinobatus schlegeli (not Müller and Henle) GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 446, 1870 (Formosa specimen).

Rhinobatus schlegelii GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 276, 1913 (part).

Snout long, bluntly pointed, margins straight or little concave; rostral ridges rather narrow, more or less separated throughout their length, nearly parallel anteriorly, diverging little posteriorly; eye 4⅓ to 4⅔ in snout, eye with spiracle nearly equals space between spiracles; mouth nearly straight, width 3⅗ to 3⅔ in preoral length; nostrils moderately long, oblique, 1⅖ to 1½ in mouth width, about 1½ in internarial, front valve extends inward nearly far as level of inner nostril edge. Outer fold of spiracle well developed, inner small, interspiracular space little over 3 in snout.

Skin covered with minute denticles smooth to touch; series of rudimentary tubercles in median line of back, around orbits and above spiracles, scarcely evident without lens.

First dorsal nearly twice high as long, origin space behind ventral base equal to or greater than interdorsal, base 3 to 3¼ in interdorsal.

Coloration not given. Length, 630 mm. (Norman.)

Formosa. Type in the British Museum.

RHINOBATOS SCHLEGELII Müller and Henle

Rhinobatus (*Rhinobatus*) *schlegelii* Müller and Henle, Syst. Beschr. Plagiostomen, p. 123, pl. 42, 1841 (type locality: Nagasaki).—Bleeker, Act. Soc. Sci. Indo-Néerl., (Japan), vol. 3, p. 41, No. 3, 1858 (Japan).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 497, 1865 (compiled).

Rhinobatus schlegelii Richardson, Ichth. China Japan, p. 195, 1846 (Sea of Japan).—Gray, List fish British Museum, p. 97, 1851 (Japan).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Nagasaki).—Günther, Cat. Fishes British Mus., vol. 8, p. 445, 1870 (Japan; not Formosan specimen).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Yokohama, Nagasaki).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—Elera, Cat. Fauna Filip., vol. 1, p. 619, 1895 (Luzon, Manila, Navotas).—Steindachner, Ann. Hofmus. Wien, vol. 11, p. 225, 1896 (Kobe, Hiogo, Nagasaki).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 60, 1897.—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 651, 1908 (Japan).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 276, 1913 (Japan).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 188, 1920 (Boshiu).—Norman, Proc. Zool. Soc. London, p. 959, fig. 12 (rostra), 1926 (Japan).—Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 10, 1931 (Nagasaki).

Rhinobatus schlegeli Schlegel, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 307, 1850 (Nagasaki Bay).—Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 337, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 41, 1901 (reference).—Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 318, 1902 (Formosa).—Schmidt and Lindberg, Bull. Acad. Sci. U. S. S. R., 1930, p. 1187 (Tsuruga).—Tanaka, Jap. Fish. Life Colours, No. 29, 1933.

Rhinobatus schlegel Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 645, 1903 (Tokyo, Wakanoura, Onomichi, Hakata, Nagasaki).

Rhinobatos schlegeli Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan and Mokpo, Korea).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 259, fig. 19, 1932 (Tsingtau).

Rhinobatos schlegelii Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 590, 1930 (Nagasaki); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (Japan).

Depth 15 to 17 to subcaudal origin; head 3½ to 3⅞, disk width 1⅕ to 1⅓ in its length. Snout 1⅖ to 1½ in head, long, pointed; eye 8⅓ to 9½, 5 to 6 in snout, 2⅕ to 2¾ in interorbital; dentary width 3⅓ to 3¾ in head, with 2 short lower labial grooves at each angle; teeth in 44 to 60 rows in each jaw, smooth, rhomboid; nostrils rather large, oblique, narrowing posteriorly, each about 1/7 dentary width; front nasal valve moderate point, inner of sections broader, extend halfway from lobe to inner nostril edge and then turned forward; hind nasal valve larger than outer, inner section of large flap much broader or larger than outer; interorbital 3⅕ to 3¼ in head, broadly depressed. Gill openings moderate, equidistant, last one smallest. Spiracle close behind eye, smaller, with large fold on hind edge.

Scales very fine, smooth to touch. No spines above eye or on shoulder. Row of small vertebral spines, about 36 before first dorsal.

First dorsal pointed, front edge 2¼ to 2⅓ in head; second dorsal like first, front edge 2⅓ to 2½; caudal 1¾ to 2⅛, subcaudal without lobe, moderate; ventral 1⅖ to 1⅔ in head.

Brown above, finely though obscurely mottled or speckled with darker. Snout each side of rostral cartilages translucent or paler brown. Under surfaces of body whitish. Lateral fold each side of tail narrow, pale or whitish.

Arabia, Philippines, Formosa, Japan, Korea. Known by its general smooth body of nearly uniform coloration. The young are marked with rather numerous though well-scattered small round whitish spots. Also the nasal flaps are greatly developed, though not shown by Müller and Henle.

U.S.N.M. No. 34546. Simoda, Japan. J. C. Brevoort. Length, 293 mm.
U.S.N.M. No. 50753. Wakanoura, Japan. Jordan and Snyder. Length, 460 mm.
U.S.N.M. No. 75874. Japan ? P. L. Jouy. Length, 329 mm.
U.S.N.M. No. 51288. Hakata, Japan. Jordan and Snyder. Length, 870 mm.
U.S.N.M. No. 26540. Japan. C. S. Morse. Length, 630 mm.
U.S.N.M. No. 75877. Japan ? P. L. Jouy. Length, 530 mm.

RHINOBATOS ANNANDALEI Norman

Rhinobatus annandalei Norman, Proc. Zool. Soc. London, 1926, p. 960, text fig. 13 (rostra) (type locality: East Channel, mouth of River Hughli, 40 fathoms).

Rhinobatus columnae (not Bonaparte) Day, Fishes of India, Suppl., p. 811 (part), 1888; Fauna British India, Fishes, vol. 1, p. 44, 1889.—Annandale, Mem. Indian Mus., vol. 2, p. 14, 1909 (off Hughli River mouth).—Pearson, Ceylon Administr. Rep., 1912–13, p. E5.—Southwell, Ceylon Administr. Rep., 1912–13, pp. E42, E43, E45, E48, E49.—Pearson, Ceylon Administr. Rep., 1914, p. E14.

Rhinobatus columnae Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 15, 1888 (Mangalore).

? *Rhynchobatus columnae* DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 193, 1904 (locality ?).

Rhinobatos rhinobatos (not Linnaeus) FOWLER, List Fish. Malaya, p. 13, 1938 (reference).

Snout moderate, bluntly pointed, margins little concave; rostral ridges more or less separated throughout their length, parallel anteriorly, diverging little posteriorly; eye 3⅗ to 3⅔ in snout; eye diameter with spiracle little greater than space between spiracles; mouth nearly straight, width 2⅓ to 2½ in preoral length; nostrils moderately long, 1⅘ in mouth width, internarial 1⅖ in nostril, front valve extending inward to level of inner nostril edge or little beyond. Both folds of spiracle strongly developed, outer more prominent, space between spiracles 2½ in snout.

Skin covered with minute denticles, rather smooth to touch; series of rather small close-set spines in median line of back, 2 to 4 on each shoulder, several around orbits and above spiracles; all spines stronger and sharper in male.

First dorsal little more than twice high as long, origin behind ventral base 1¼ to 1⅓ in that between 2 dorsals, base 2¼ to 2⅖ in interdorsal.

Color not given. Length, 415 mm. (Norman.)

India, Ceylon. Type in the British Museum.

RHINOBATOS LIONOTUS Norman

Rhinobatus lionotus NORMAN, Proc. Zool. Soc. London, 1926, p. 961, text fig. 14 (rostra) (type locality: East Channel, mouth of River Hughli, in 40 fathoms).

Rhinobatis schlegeli (not Müller and Henle) ANNANDALE, Mem. Indian Mus., vol. 2, p. 15, 1909 (off Hugli River mouth and Mutlah River).

Snout moderate, bluntly pointed, margins scarcely concave; rostral ridges more or less separated throughout their length, parallel anteriorly, diverging posteriorly; eye 3⅖ in snout, eye with spiracle about equals space between spiracles; mouth nearly straight, width 2⅖ in preoral length; nostrils of moderate length, oblique, 1⅔ in mouth width, 1⅓ times internarial, front valve extending inwards about to level of inner nasal edge. Both folds of spiracle very strongly developed, outer more prominent.

Skin covered with minute denticles, smooth to touch; series of minute tubercles in median line of back, single one on each shoulder and several around orbits and above spiracles.

First dorsal twice high as long, origin distance behind bases of ventrals about equals interdorsal, base 2⅘ in interdorsal.

Color not given. Length, 500 mm. (Norman.)

Bengal. Type in the British Museum.

RHINOBATOS HYNNICEPHALUS Richardson

Rhinobatus hynnicephalus RICHARDSON, Ichth. China Japan, p. 195, 1846 (type locality: China Seas; Canton).—GRAY, List fish British Museum, p. 97, 1851 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 274, 1913 (copied).—NORMAN, Proc. Zool. Soc. London, 1926, p. 962, fig. 15 (rostra) (Japan, Hiroshima, Inland Sea of Japan).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 10, 1931 (Nagasaki).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. b, vol. 1, p. 154, figs. 6–6a, pl. 1, fig. 2 (scales), pl. 3, fig. 5, (teeth) 1932 (Tsingtao; Hong Kong).

Rhinobatos hynnicephalus FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (reference); Hong Kong Nat., vol. 1, No. 3, p. 133, 1930 (copied).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 100, fig. 5, 1933 (Chusan).

Rhinobatus (Rhinobatus) polyophthalmus BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 26, p. 129, 1854 (type locality: Nagasaki).

Rhinobatus (Syrrhina) polyophthalmus BLEEKER, Act. Soc. Sci. Indo-Néerland. (Japan), vol. 3, No. 3, p. 7, pl. 4, 1858 (Nagasaki, Japan).

Rhinobatus polyophthalmus JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 646, 1903 (Wakanoura, Hiroshima, Hakata, Nagasaki).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 274, 1913 (China).

Rhinobatos polyophthalmus FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (reference); Hong Kong Nat., vol. 1, p. 133, 1930 (compiled).

Rhinobatus schlegeli (not Müller and Henle) GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 446, 1870 (Japan).

Raia (Syrrhina) columnae (not Bonaparte) BLEEKER, Nederl. Tijdschr. Dierk, vol. 4, p. 115, 1874 (Chinese drawing).

Rhinobatus columnae STEINDACHNER, Ann. Hofmus. Wien, vol. 11, p. 225, 1896 (Kobe, Hiogo, Nagasaki).

?*Rhinobatos rhinobatos* (not Linnaeus) WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 102, fig. 6, 1933 (Chusan).

Snout moderate, bluntly pointed, edges scarcely concave; rostral ridges rather broad, narrowly separated anteriorly, diverging little posteriorly; eye 4⅔ to 5⅘ in snout, eye with spiracle 1⅕ to 1¼ in space between spiracles; mouth nearly straight, width 3 in preoral length; nostrils moderately long, oblique, 1½ to 1⅗ mouth width, about 1¼ times internarial, front valve extending inwards to level of inner nostril edge or little beyond. Outer fold of spiracle moderately developed, inner rudimentary or absent, interspiracular width 2⅖ to 2½ in snout.

Skin covered with minute denticles, smooth to touch; series of very small, blunt tubercles in median line of back, few around orbits and above spiracles.

First dorsal about twice high as long, origin distance behind ventral base 1⅕ to 1¼ times interdorsal, base 2½ to nearly 3 in interdorsal.

Back brownish with groups of small, blackish-brown spots, sometimes forming oval or rounded rings. Markings tend to become less conspicuous with age. Young with faint dark blotch below end of snout. Length, 700 mm. (Norman.)

China, Japan.

RHINOBATOS ANNULATUS Müller and Henle

Rhinobatus (*Syrrhina*) *annulatus* (Andrew Smith) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 116, 1841 (type locality: Cape of Good Hope).—ANDREW SMITH, Ill. Zool. South Africa, Fishes, pl. 16, 1842 (Cowie River; Algoa Bay).—GRAY, List fish British Museum, p. 94, 1851 (Cape Sea).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 487, pl. 10, fig. 6 (scutes), 1865 (type).

Rhinobatus annulatus PAPPE, Edible Fish South Africa, p. 22, 1854 (Table Bay).—KNER, Reise *Novara*, Fische, p. 416, 1865 (Cape of Good Hope).—PAPPE, Edible Fish South Africa, ed. 2, p. 22, 1866 (Cape Seas).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 272, 1913 (South and East Africa).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 59, fig. 9a (nostrils and mouth), 1925 (Simon's Bay to Natal).—NORMAN, Proc. Zool. Soc. London, 1926, p. 964, text fig. 17 (type; Cape of Good Hope, Port Natal, Bird Island, Zululand coast).

Rhinobatus (*Rhinobatus*) *annulatus* BLEEKER, Nat. Tijdschr. Nederland. Indié, vol. 21, p. 58, 1860 (reference).

Rhinobatus columnae (not Bonaparte) GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 446, 1870 (Cape of Good Hope, Natal).—THOMPSON, Marine Biol. Surv. South Africa Rep. No. 2, p. 155, 1914.—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 285, 1916 (references).

Rhinobatus blochii (part) REGAN, Ann. Natal Gov. Mus., vol. 1, p. 242, 1908 (Durban Bay).

Rhinobatus rhinobatus (not Linnaeus) VON BONDE and SWART, Fishes Marine Surv. South Africa, Spec. Rep. No. 5, p. 3, 1923 (reference).

Snout moderate, bluntly pointed, margins straight or very little concave; rostral ridges rather narrow, separated throughout their length, parallel or converging little anteriorly, diverging posteriorly; eye 5 to 5¾ in snout, eye with spiracle 1⅕ to 1¼ in space between spiracles; mouth nearly straight, width 2¾ to 3 in preoral length; nostrils moderately long, oblique, 1¾ to nearly twice mouth width, internarial about equals nostril, front valve extends inward well beyond level of inner nostril edge, nearly meeting that of opposite side. Both folds of spiracle well developed, outer more prominent, space between spiracles 2⅓ to 2⅗ in snout.

Skin covered with minute denticles, rather smooth to touch; series of small, compressed spines in median line of back, in 1 or 2 groups on each shoulder and some smaller spines around orbits and above spiracles; all spines less prominent with age.

First dorsal nearly twice high as long, origin space behind ventrals about equal to interdorsal, base 2⅓ to nearly 3 in interdorsal.

Upper surface of body with dark annular ocelli, largest smaller than eye. Length, 1,020 mm. (Norman.)

South Africa.

RHINOBATOS LEUCOSPILUS Norman

Rhinobatus leucospilus NORMAN, Proc. Zool. Soc. London, 1926, p. 966, fig. 18 (rostra) (type locality: Durban, Natal).—BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 1014, 1927 (note).

Rhinobatus blochii (not Müller and Henle) REGAN, Ann. Natal Gov. Mus., vol. 1, p. 242, 1908 (Durban Bay).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 11, pt. 2, p. 55, 1911 (Natal).

Rhinobatus blochi BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 61, 1925 (part).

Very close to *Rhinobatos annulatus* but snout rather shorter and broader; eye 3¼ to 4 in snout, eye with spiracle little less than space between spiracles; mouth width 2½ to 2⅗ in preoral length; space between outer nostril edge and lateral snout edge 2½ to 2¾ in preoral length. Space between spiracles 2 to 2¼ in snout.

Spines on back and shoulders minute.

Back brownish, margins of pectorals and ventrals bluish gray. Snout and pectorals with number of pale blue-gray spots and blotches symmetrically arranged. Length, 415 mm. (Norman.)

Natal. Type in the British Museum.

RHINOBATOS ZANZIBARENSIS Norman

Rhinobatus zanzibarensis NORMAN, Proc. Zool. Soc. London, 1926, p. 966, text fig. 19 (rostra) (type locality: Zanzibar).

Rhinobatus schlegelii (not Müller and Henle) GÜNTHER, Fishes of Zanzibar, p. 142, 1866 (Zanzibar).

Rhinobatus columnae (not Bonaparte) GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 446, 1870 (Zanzibar specimens).

Snout moderate, bluntly pointed, margins straight; rostral ridges rather broad, separated throughout their length, almost parallel; eye 4½ in snout, eye with spiracles about equals space between spiracles; mouth nearly straight, nearly 3 in preoral length; nostrils rather long, oblique, nearly 1½ in mouth width, 1½ times internarial, space between outer nasal edge and lateral snout edge more than 4 times preoral length, front valve extending inward well beyond level of inner nostril edge, separated from that of opposite side by space which 2¾ to 3 in internarial. Both folds of spiracle well developed, outer more prominent.

Skin covered with minute denticles; series of very small, blunt spines in median line of back, in 2 groups on each shoulder and some smaller spines around orbits and above spiracles.

First dorsal about 1½ times high as long, origin distance behind ventral bases 1⅓ to 1½ times interdorsal, base 2⅚ in interdorsal.

Coloration not given. Length, 750 mm. (Norman.)

Zanzibar.

RHINOBATOS OCELLATUS Norman

Rhinobatos ocellatus NORMAN, Proc. Zool. Soc. London, 1926, p. 967, fig. 20 (rostra) (type locality: Bird Island, Algoa Bay).—BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 1015, 1927 (compiled).

Rhinobatus columnae (not Bonaparte) REGAN, Ann. Natal Gov. Mus., vol. 1, p. 242, 1908 (Bird Island).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 3, p. 285, 1916 (references).

Close to *Rhinobatos zanzibarensis.* Mouth width 3½ in preoral length, which more than 8 times in space from snout tip to vent; nostrils moderately long, oblique, 1⅔ in mouth width, 1½ in internarial; space between outer nostril edge and lateral edge of snout 3⅗ in preoral length, front valve extending inward well beyond level of inner nostril edge, separated from that of opposite side by distance 3½ in internarial.

Skin covered with minute denticles; series of small, blunt spines in median line of back, single pair on each shoulder, several spines around orbits and above spiracles.

First dorsal about twice high as long, origin behind ventral bases space little greater than interdorsal, base 3⅗ in interdorsal.

Back brownish, with numerous bluish-gray ocelli, largest smaller than eye. Length, 700 mm. (Norman.)

South Africa.

RHINOBATOS BLOCHII Müller and Henle

Rhinobatus (Syrrhina) blochii MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 115, pl. 37, fig. 1, 1841 (type locality: Cape of Good Hope).—GRAY, List fish British Museum, p. 94, 1851 (Cape of Good Hope).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 488, pl. 10, fig. 5 (scutes), 1865 (Cape of Good Hope).

Rhinobatus blochii BLEEKER, Nat. Tijdschr. Nederland Indie, vol. 21, p. 58, 1860 (reference).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 477, 1870 (Cape of Good Hope).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Cape of Good Hope).—PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p. 853, 1877 (Cape of Good Hope).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 271, 1913 (Cape of Good Hope).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 284, 1916 (references).—NORMAN, Proc. Zool. Soc. London, p. 968, text fig. 21, 1926 (Cape of Good Hope; Table Bay).

Rhinobatus blochi BARNARD, Ann. South African Mus., vol. 21, p. 61, 1925 (Natal); pt. 2, p. 1014, 1927 (note).

Snout short, broad, obtusely pointed, margins somewhat convex; rostral ridges rather narrow, separated throughout length, parallel anteriorly, diverging little posteriorly; eye 3½ to 4 in snout, eye with spiracle 1¼ to 1⅖ in space between spiracles; mouth nearly straight, width 2¼ to 2⅖ in snout; nostrils short, oblique, 1¾ to nearly twice mouth width, about equal internarial, front valve extending inward well beyond level of inner nostril edge, nearly meeting that of opposite side. Only outer spiracular fold developed, interspiracular space 1⅔ to 1⅚ in snout.

Skin covered with minute denticles, smooth to touch; series of small spines in median line of back, smaller ones on head and scapular region; spines less prominent and irregular with age.

First dorsal 1½ to 1¾ times high as long, origin behind ventral base equals or little greater or less than interdorsal, base 2 to 2⅓ in interdorsal.

Young with few, small, round white spots on head and body above. Length, 960 mm. (Norman.)

South Africa.

Subgenus RHINOBATOS Linck

RHINOBATOS GRANULATUS Cuvier

Rhinobatus granulatus CUVIER, Règne animal, ed. 2, vol. 2, p. 396, 1829 (no locality).—BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816 (name only).—GRAY, List fish British Museum, p. 95, 1851 (Mediterranean?, India).—BLEEKER, Verh. Batav. Genotsch. (Bengal), vol. 25, p. 82, 1853 (reference).—BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 36, 1860 (Calcutta).—DAY, Fishes of Malabar, p. 275, 1865 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 443, 1870 (part).—DAY, Proc. Zool. Soc. London, 1870, p. 704 (Andamans).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Bangkok and Singapore).—DAY, Fishes of India, pt. 4, p. 732, pl. 192, fig. 2, 1878 (Malabar).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 2, p. 366, 1878 (Port Darwin); vol. 5, p. 307, 1880 (Port Jackson, Cape York); vol. 6, p. 371, 1881 (Port Jackson, Cape York).—KÁROLI, Termesz. Füzetek, Budapest, vol. 5, p. 148, 1881 (Singapore).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 598, 1883 (New Guinea).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 49, 1885 (Macassar).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 14, 1888 (lagoon on Stradbroke Island, Moreton Bay, Madras; South East New Guinea).—DAY, Fauna British India, Fishes, vol. 1, p. 42, fig. 17, 1889.—KENT, Great Barrier Reef, p. 370, pl. 48, fig. 4, 1893 (Torres Straits to Moreton Bay).—JOHNSTONE, Fasc. Malayenses, Annandale and Robinson, Zool., pt. 2, p. 302, 1903 (Patani Bay).—VOLZ, Rev. Suisse Zool., vol. 12, p. 484, 1904 (Padang; Kwala); Nat. Tijds. Nederland. Indië, vol. 66, p. 240, 1907 (Langhat).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 272, 1913 (India).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—NORMAN, Proc. Zool. Soc., London, 1926, p. 949, text fig. 3 (rostra) (Madras, India, type of *Rhinobatus spinosus;* Shanghai).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 352, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e^ note, p. 73, 1929 (Cochinchina).—CHEVEY, Inst. Océanogr. Indochine, 19^e^ note, p. 7, 1932 (Indo-China).—HORA and MUKERJI, Rec. Indian Mus., vol. 38, pp. 18, 21, pl. 2, fig. 1, 1936 (Maungmagan, Burma).

Rhinobatus (*Rhinobatus*) *granulatus* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 117, pl. 38, 1841 (Tranquebar and Pondicherry, types).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 82, 1853 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 493, 1865 (Malabar, Ganges River, Pondicherry).

Rhinobatis granulatus ANNANDALE, Mem. Indian Mus., vol. 2, p. 14, 1909 (off Orissa).

Rhinobatos granulatus Fowler, Mem. Bishop Mus., vol. 10, p. 24, 1928 (Port Moresby, New Guinea); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (reference); Hong Kong Nat., vol. 1, p. 132, 1930 (compiled); Mem. Bishop Mus., vol. 11, no. 5, p. 314, 1931 (reference); List Fish. Malaya, p. 13, 1938 (reference).

Rhinobatus rhinobatus (not Linnaeus) Schneider, Syst. Ichth. Bloch, p. 353, 1801 (India, Coromandel, Red Sea).

?*Rhinobatus russellianus* Blainville, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816 (name only).

?*Rhinobatus* (*Rhinobatus*) *philippi* Müller and Henle, Syst. Beschr. Plagiostomen, pl. 119, pl. 39, 1841 (type locality: Ocean).

Rhinobatus philippi Peters, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 278, 1913 (Queensland).

Rhinobatus tuberculatus (Cuvier) Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 9, 1853 (on *Suttiwarah* Russell, Fishes of Coromandel, vol. 1, p. 7, pl. 11, 1803, type locality: Vizagapatam).

Rhinobatus spinosus Günther, Cat. Fishes British Mus., vol. 8, p. 518, 1870 (type locality: "Mexico," erroneous).

Rhinobatus thouini (not Shaw) Day, Fishes of India, pt. 4, p. 732, pl. 190, fig. 4, 1878 (Andamans).

Rhinobatus acutus Garman, Bull. Mus. Comp. Zool., vol. 51, p. 253, 1908 (type locality: Ceylon); Mem. Mus. Comp. Zool., vol. 36, p. 273, pl. 17b, figs. 1–2, 1913 (type).

Depth 14½ to 17⅗ to subcaudal origin; head 3 to 3⅗, disk width 1¼ to 1⅖ its own length. Snout 1⅓ to 1⅖ in head, long, pointed; eye 8¾ to 12⅘, 7¼ to 9 in snout, 3 to 4 in interorbital; dentary width 3⅓ to 3⅘ in head, with short upper and lower labial folds at each angle; teeth in 53 to 60 rows, smooth, rhomboid; nostrils large, wide, oblique, narrowing posteriorly, each ¾ dentary width; valves feeble, with short anterior lobe; internarial width 1¾ to 1⅘ in nostril; interorbital 3 to 3½ in head, depressed. Gill openings nearly equidistant, last shortest. Spiracle close behind eye, small, hind edge with 2 obscure papillae.

Above rather coarsely tuberculate, rough to touch. Row of fine supraorbital tubercles, extending continuously over spiracle. About 19 to 30 larger vertebral tubercles to first dorsal, interdorsal smaller; cluster or patch of several slightly enlarged tubercles on each shoulder.

First dorsal pointed, front edge 2⅗ to 3⅕ in head; second dorsal like first, front edge 2⅗ to 3$\frac{1}{10}$; caudal 1⅘ to 2⅓, subcaudal moderate; ventral 1⅞ to 2¼ in head.

Above brown, each side of rostral cartilages snout buff brown. Dorsals and caudal grayish. Under surfaces white.

Red Sea, India, Ceylon, Andamans, Siam, Singapore, East Indies, Cochin China, China, Northern Territory, Queensland, New South Wales. My specimens agree with Müller and Henle's figure. Their example was 350 mm. long. Known by its roughness, the asperities in the back quite coarse, especially about the vertebral and shoulder tubercles. Its snout is rather wide terminally. Two seen in the Queensland Museum from Moreton Bay, one of 1,525 mm. length.

9385. Cebu market. September 2, 1909. Length, 520 mm.
7621. Mouth of Malampaya River and vicinity. December 26, 1908. 498 mm.
5082. Sandakan, Borneo. March 1, 1908. Length, 595 mm.
U.S.N.M. No. 30530. Port Moresby, New Guinea. Australian Museum. Length, 278 to 368 mm. 2 examples.
U.S.N.M. No. 40022. Port Moresby, New Guinea. Length, 530 mm.
U.S.N.M. No. 29015. No locality. Australian Museum. Length, 930 mm.

RHINOBATOS OBTUSUS Müller and Henle

Rhinobatus (*Rhinobatus*) *obtusus* Müller and Henle, Syst. Beschr. Plagiostomen, p. 122, pl. 37, fig. 2, 1841 (type locality: India, Pondicherry, Malabar).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 21, p. 58, 1860 (name).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 493, 1865 (Malabar, Indies, Pondicherry).

Rhinobatus obtusus Gray, List fish British Museum, p. 97 1851 (Cape Seas).—Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 37, 1860 (Calcutta).—Day, Fishes of Malabar, p. 274, 1865.—Günther, Cat. Fishes British Mus., vol. 8, p. 443, 1870 (East Indies).—Thompson, Marine Biol. Rep. South Africa, No. 2, p. 155, 1914 (Natal).—Norman, Proc. Zool. Soc. London, p. 950, text fig. 4 (rostra), 1926 (India, East Indies).—Barnard, Ann. South African Mus., vol. 21, pt. 2, p. 1014, 1927 (note).

Rhinobatus halavi (not Forskål) Day, Fishes of India, pt. 4, p. 731, pl. 192, fig. 4, 1878 (Mangalore).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 275, 1913 (part).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 62, 1925 (Natal).

Snout short, broad, obtusely pointed, margins scarcely concave; rostral ridges rather narrow, more or less separated throughout their length, diverging little anteriorly and posteriorly; eye about 8 in snout, eye and spiracle 1⅖ to 1⅗ in space between spiracles; mouth nearly straight, width 1⅚ in preoral length; nostrils rather long, oblique, twice mouth width, nearly equal internarial, front valve scarcely extending inwards. Only outer fold of spiracle developed, weak, space between spiracles 2⅕ in snout.

Denticles enlarged on back, scapular region and top of head; some in median line of back spinous; no distinct series of spines.

First dorsal nearly twice high as long, origin distance behind ventral bases twice interdorsal, base 2¼ to 2½ in interdorsal.

Color not given. Length, 930 mm. (Norman.)

South Africa, Natal, India, East Indies.

RHINOBATOS THOUIN (Anonymous)

Raja thouin Anonymous, Allg. Lit.-Zeit., vol. 3, pp. 287, 677, 685, pl. 1, figs. 3, 4, 1798 (no locality given).

Raja thouinianus Shaw, General zoology, vol. 5, 1804, p. 318, pl. 147, fig. 2, 1804 ["Mus. Prince of Orange". On *La raie thouin* Lacépède, Hist. Nat. Poiss., vol. 1, p. 134, pl. 1, figs. 3–5, 1798 (locality unknown)].

Rhinobatus thouini VAN HASSELT, Algemein Konst. Letterbode, p. –, 1823 (Java); Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824 (Java).—GRAY, List fish British Museum, p. 96, 1851 (reference).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 442, 1870 (Pinang; East Indies).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Rockhampton and Port Mackay).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Bangkok and Batavia).—DAY, Fishes of India, pt. 4, p. 732, 1878 (part).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 372, 1881 (West Australia; on Castelnau).—KÁROLI, Termesz. Füzetek, Budapest, vol. 5, p. 148, 1882 (Yokohama).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, 1883, p. 280, 1884 (Hood Bay, New Guinea).—DAY, Fauna British India, Fishes, vol. 1, p. 44, 1889.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Buntal and Moratabas).—PELLEGRIN, Ann. Mus. Zool. Univ. Napoli, new series, vol. 3, No. 27, p. 4, 1912 (Singapore; Assab).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 597, 1913 (Makassar and Aru Islands).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 276, 1913 (Pinang).—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 464, 1924 (Tala Sap, Singora).—CHABANAUD, Bull. Econom. Indo-Chine, vol. 6, No. 169, p. 563, 1924 (Gulf of Siam); Service Océanogr. Pêches Indo-Chine, 1^e note, p. 5, 1926 (Gulf of Siam).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e note, pp. 73, 175, 1929 (Cochin China).—SUVATTI, Index Fish. Siam, p. 4, 1937 (Canthaburi; Samut Prakan; Maenam Wen, East Coast).

Rhinobatus (*Rhinobatus*) *thouini* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 120, 1841 ("Surinam; Mediterranean").—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 500, pl. 10, fig. 2, a–b (snout and teeth), 1865 (type locality unknown; Red Sea).

Rhinobatos thouinianus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, p. 460, 1904 (Baram, Borneo); Mem. Bishop Mus., vol. 10, p. 24, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (reference); List Fish. Malaya, p. 14 (246), 1938 (reference).

Rhinobatus thouiniana NORMAN, Proc. Zool. Soc. London, 1926, p. 951, text fig. 5 (rostra) (Pinang and Malay Archipelago).

Rhynchobatus thonini DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 193, 1904 (locality?).

? *Rhinobatus coromandelicus* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816 (name only).

Rhinobatus rhinobatus (not Linnaeus) BENNETT, Life of Raffles, p. 694, 1830 (Sumatra).

Rhinobatus (*Rhinobatus*) *ligonifer* CANTOR, Journ. Asiat. Soc. Bengal, vol. 18, p. 1397, pl. 14, 1849 (type locality: Pinang, Malay Peninsula, Singapore).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 59, 1852 (Bantam and Samarang).

Rhinobatus ligonifer BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 409, 1852 (Sampit); Nederland. Tijdschr. Dierk., vol. 1, p. 73, 1863 (Banka); vol. 2, p. 172, 1865 (Siam; reference).

Snout rather long, expanded at tip, margins distinctly concave; preorbital length 3⅓ to 3⅗ in space between spiracles, preoral length little more than 3 times mouth width. Rostral cartilage narrow, expanded anteriorly, ridges converge greater part their length. Eye 8 to 8¾ in preorbital; combined eye and spiracle 1⅓ to nearly 1½ in space between spiracles. Both folds of spiracle feebly developed, outer more prominent. Nostrils long, oblique, 1¼ in mouth width, nearly twice internarial space; front valve not extending inward. Mouth nearly straight.

Denticles somewhat enlarged on back, scapular region, and top of head; series of strong compressed spines in median line of back, 2 on each shoulder, and several around orbits and above spiracles.

First dorsal about twice high as long, origin space behind base of ventral $1\frac{1}{5}$ to $1\frac{1}{4}$ that between two dorsals, base $2\frac{1}{3}$ to $2\frac{1}{2}$ in interdorsal space.

Length, 330 to 405 mm. (Norman.)

Red Sea, Malaya, East Indies.

RHINOBATOS TYPUS Bennett

Rhinobatus typus Bennett, Life of Raffles, p. 694, 1830 (type locality: Sumatra).

Rhinobatus armatus Gray, Illustr. Indian Zool. Hardwicke, vol. 2, pts. 13–14, pl. 99, 1832–34 (type locality: India); List fish British Museum, p. 96, 1851 (reference).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 16, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 5, p. 154, 1853 (Macassar); vol. 15, p. 243, 1858 (Singapore); vol. 22, p. 98, 1860 (New Guinea); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 298, 1868 (Waigiu).—Peters, Monatsb. Akad. Wiss. Berlin, 1876, p. 853 (Bougainville Island).—Günther, Journ. Mus. Godeffroy, pt. 17, p. 492, 1910 (compiled).—Ogilby, Mem. Queensland Mus., vol. 3, p. 132, 1915 (Moreton Bay); Commerce. Fish Fisher. Queensland, p. 45, 1915 (Moreton Bay); vol. 5, pp. 85, 95, fig. 1 (ventral view) 1916 (Queensland coast).—McCulloch and Whitley, Mem. Queensland Mus., vol 8, pt. 2, p. 129, 1925 (reference).—Norman, Proc. Zool. Soc. London, p. 952, text fig. 6, 1926 (India, Singapore, Macassar, type of *Rhinobatus typus*, Cape York, Groote Eyland, West Australia).—Whitley, Australian Zoologist, vol. 4, p. 228, 1926 (North West Islet and Townsville, Queensland).—Herre, Fishes Herre Philippine Exped., 1931, p. 12, 1934 (Sitanki).

Rhinobatus (*Rhinobatus*) *armatus* Müller and Henle, Syst. Beschr. Plagiostomen, p. 119, 1841 (India).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 60, 1852 (Samarang and Singapore); Nat. Tijdschr. Nederland. Indië, vol. 3, p. (54) 85, 1852 (Singapore; Samarang); Verh. Batav. Genootsch. (Bengal), vol. 25, p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 9, p. 283, 1855 (Macassar); Act. Soc. Sci. Indo-Néerl., vol. 1, No. 3, p. 10, 1856 (Macassar); vol. 6, No. 2, p. 3, 1859 (Doreh, New Guinea).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 494, pl. 10, fig. 4 (scutes), 1865 (type "sans indication d'origine").

Rhinobatos armatus Fowler, List Fish. Malaya, p. 13 (246) 1938 (reference).

Raja (*Rhinobatus*) *armatus* Bleeker, Nederland. Tijdschr. Dierk., vol. 2, p 271, 1865 (reference).

Rhinobatus granulatus (not Cuvier) Günther, Cat. Fishes British Mus., vol. 8, p. 443, 1870 (India; type of *Rhinobatus typus*).—Day, Fishes of India, pt. 4, p. 732, 1878.

Rhinobatus halavi (not Forskål) Garman, Mem. Mus. Comp. Zool., vol. 36, p. 275, 1913 (part).—Chevey, Inst. Océanogr. Indochine, 19ᵉ note, p. 7, 1932 (Indo China).—Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 16, 1937 (reference).

Rhinobatos halavi Fowler, Mem. Bishop Mus., vol. 10, 1928, p. 24 (compiled).

Snout moderate, bluntly pointed, margins scarcely concave; rostral ridges narrow, closely approximated for greater part of length, diverging little posteriorly; eye 6¼ to 8½ in snout, eye with spiracle 1¼ to 1⅖ in space between spiracles; mouth nearly straight, width 3 in preoral length; nostrils long, oblique, ⅚ of or nearly equal mouth width, 2¼ to 2⅖ times internarial, front valve not extending inward. Both folds of spiracles feebly developed, outer more prominent, space between spiracles 3 to 3⅕ in snout.

Denticles somewhat enlarged on back, scapular region and top of head; series of rather strong compressed spines in median line of back, 1 or 2 groups on each shoulder and several smaller spines around orbits and above spiracles.

First dorsal twice or more than twice as high as long, origin distance behind ventral base 1⅓ to 1⅗ times interdorsal, base 2 to 2¼ in interdorsal.

Coloration not given. Length to 550 mm. (Norman.)

India, Singapore, East Indies, Western Australia, Northwest Territory, North Australia, Queensland, Melanesia.

RHINOBATOS HALAVI (Forskål)

Raja halavi Forskål, Descript. Animal, pp. 8, 19, 1775 (type locality: Djedda).—Walbaum, Artedi Pisc., vol. 3, p. 535, 1792 (copied).

Raia halavi Cuvier, Règne animal, ed. 2, vol. 2, p. 396, 1829 (reference).

Rhinabatus halavi Rüppell, Atlas Reise Nördl. Afrika, Fische, p. 55, 1828 (Red Sea).

Rhinobatus halavi Rüppell, Atlas Reise Nördl. Afrika, Fische, pl. 14, fig. 2, 1828.—Gray, List fish British Museum, p. 95, 1851 (China, Red Sea, India).—Günther, Cat. Fishes British Mus., vol. 8, p. 442, 1870 (West Africa, Gambia, Red Sea, China).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 675, 1871 (Koseir, Red Sea).—Day, Fishes of India, pt. 4, p. 731, 1878.—Kossman, Zool. Anz., vol. 2, p. 21, 1879 (Red Sea).—Kossman and Raüber, Zool. Ergebn. Reise Roth. Meer, p. 32, 1879 (Red Sea).—Klunzinger, Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, pt. 1, p. 428, 1880 (Australia).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 14, 1888 (Cochin, Malabar).—Day, Fauna British India, Fishes, vol. 1, p. 43, 1889.—Boulenger, Proc. Zool. Soc. London, p. 243, 1889 (Muscat).—Elera, Cat. Fauna Filip., vol. 1, p. 619, 1895 (Luzon, La Union).—Steindachner, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 160, 1907 (Gischin).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 275, 1913 (part).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—Malpas, Ceylon Administr. Rep., 1921, pp. E7, E8.—Norman, Proc. Zool. Soc. London, p. 956, fig. 9, 1926 (Red Sea, Muscat, China).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 73, 1929 (Cochinchina).

Rhinobatus (*Rhinobatus*) *halavi* Müller and Henle, Syst. Beschr. Plagiostomen, p. 120, 1841 (Red Sea).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 496, 1865 (Red Sea).

Rhinobatis halavi Annandale, Mem. Indian Mus., vol. 2, p. 13, 1909 (India).

Rhinobatus halvai SOUTHWELL, Ceylon Administr. Rep., 1912–13, p. E44. (Error.)

Rhinobatos halavi FOWLER, Mem. Bishop Mus., vol. 10, p. 24, 1928 (part); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (reference); Hong Kong Nat., vol. 1, p. 133, fig. 16, 1930 (compiled).

Rhinobatus schlegeli (not Müller and Henle) BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).

Rhinobatus granulatus (not Cuvier) BAMBER, Journ. Linn. Soc. London, vol. 31, Zool., p. 477, 1915 (Sudanese Red Sea).

Depth 17 to 17½ to subcaudal origin; head 3⅓; disk width 1¾ to 2¾ its length. Snout 1½ in head, moderately broad, rather evenly rounded; eye 9½ to 10, 6¾ to 6⅞ in snout, 3⅖ to 4 in interorbital; dentary width 3 to 3⅗ in head, with 3 or 4 very short folds at each mouth corner; teeth in 43 to 50 rows in jaws, each with small, obtuse cusp, rhombic; nostrils large, narrowing inward, length 1½ in dentary width or greater than internarial width; front nasal valve feeble, narrow, short point and narrow lobe reaches halfway from lobe to inner edge of nostril; hind nasal valve larger than front one, broader and inner rather narrow section reaches about ⅖ to inner nostril edge; interorbital 2⅔ to 2⅞ in head, medially flat, with each orbital rim little elevated anteriorly and above spiracles. Gill openings subequal, equidistant. Spiracle large, deep, close behind eye and each hind edge with 2 folds.

Body rather smooth, usually 2 or 3 large preocular spines and 3 above each spiracle; 15 to 19 predorsal spines to first dorsal and 1 interdorsal vertebral spine besides 1 or 2 wide-set tubercles on each shoulder; spines all large in young.

First dorsal with front edge 3⅖ to 3¾ in head, fin broad; second dorsal similar, front edge 3 to 3½ in head; caudal 1⅘ to 1⅞, subcaudal moderate, without lobe; pectoral moderate; ventral 1⅔ to 1¾ in head; claspers narrow, slender, extend ⅘ to hind ventral edge.

Olive above, disk nearly cinnamon marginally and cinnamon translucence each side of snout. Under surface of body white.

Red Sea, Arabia, India, Burma, Philippines, Cochinchina, China, Australia. My specimens do not show the brownish spot below the end of the snout, as described by Garman. The species is known by its large spinous bucklers and comparatively broad snout, with the shagreen of the skin rather smooth to the touch. Also reported from the Eastern Atlantic on the West African coast.

U.S.N.M. No. 47612. Red Sea. McCormick. Length, 373 mm.
U.S.N.M. No. 89490. Burma. G. E. Gates. Length, 173 mm.
U.S.N.M. No. 49316. Red Sea. M. Bellotti. Length, 275 mm.

The following species said to resemble *Rhinobatos cemiculus* G. Saint-Hilaire, but that species with the eye 6 in preorbital and but 2 spines longitudinally on each shoulder.

RHINOBATOS PETITI Chabanaud

Rhinobatus (*Rhinobatus*) *petiti* CHABANAUD, Bull. Mus. Hist. Nat. Paris, ser. 2, vol. 1, p. 365, fig. 1, 1929 (type locality: Madagascar, west coast, Nosy Marirana Bank, between Ankilibe and Tulear).

Snout elongate, obtuse, its end not expanded; lateral edges partly straight, slightly convex, level with nostrils. Rostral crests straight, nearly in contact to middle, feebly dilated in front. Eye 7 in preorbital, 4 in interorbital. Combined eye and spiracle ¾ space between spiracles. Mouth little curved, width 2⅓ in preoral length. Nostrils long, oblique; internasal space ⅓ of nostril; anterior nasal valve forms straight lobe.

Body covered with extremely fine denticles, flat, and smooth above, granular on rostral crests and middle of body, forming obtuse tubercles on front and upper border of orbit; vertebral series of tubercles present, also short series of 3 or 4 on each shoulder.

First dorsal triangular, hind edge concave, front edge 1⅔ in preorbital length; second dorsal like first; caudal long and straight.

Body above uniform reddish brown. Dorsals and caudal blackish, except bases, hind borders, and angles. Below whitish.

Length, 665 mm. (Chabanaud.)

Genus APTYCHOTREMA Norman

Aptychotrema NORMAN, Proc. Zool. Soc. London, 1926, p. 977. (Type, *Rhinobatus* (*Syrrhina*) *bougainvillii* (Valenciennes) Müller and Henle.)

Differs from *Rhinobatos* in the nearly transverse nostrils, inward extension of front nasal valve crossing inner angle of nostril and absence of spiracular folds.

Australia.

ANALYSIS OF SPECIES

a^1. Snout 1⅓ to 1⅖ in head measured to first gill opening; mouth slightly curved; teeth subequal; mouth width 3½ in preoral length-------- banksii

a^2. Snout 1½ to 1⅔ in head measured to first gill opening; mouth well curved; median lower teeth little enlarged; mouth width 2⅘ in preoral length. bougainvillii

APTYCHOTREMA BANKSII (Müller and Henle)

Rhinobatus (*Rhinobatus*) *banksii* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, pp. 123, 192, 1841 (type locality: New Holland).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 490, 1865 (Australia).

Rhinobatus banksii GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 446, 1870 (compiled).—HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 82, 1872 (compiled).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 372, 1881 (Australia; on Günther).—WAITE, Mem. Australian Mus., vol. 4, p. 38, pl. 3, 1899 (New South Wales).—OGILBY, Commerc. Fish Fisher. Queensland, p. 46, 1915 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 85, text fig. 1 (left figure ventral view), 1916 (South Hill, Moreton Bay, Cartwright Point, Low Bluff, Double Island Point, Hervey Bay, Hummocky Island, 7 to 24 fathoms).—MCCULLOCH and WHIT-

LEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—McCULLOCH, Biol. Res. *Endeavour*, vol. 5, pt. 4, p. 157, figs. 1–4, 1926 (off Bustard Head Light and Fraser Island, 15 to 20 fathoms).

Rhinobatus (*Syrrhina*) *banksii* GRAY, List fish British Museum, p. 95, 1851 (reference).

Rhinobatis banksii STEAD, Fishes of Australia, p. 233, 1908.

Rhinobatos banksii McCULLOCH, Fishes of New South Wales, ed. 2, p. 10, pl. 2, fig. 30a, 1927.

Aptychotrema banksii NORMAN, Proc. Zool. Soc. London, 1926, p. 978, text fig. 30 (rostra) (Botany Bay).—WHITLEY, Australian Zool., vol. 5, p. 354, 1929 (note).

Raja rostrata SHAW and NODDER, Natur. Misc., vol. 5, p. 173, 1794 (no locality).—(Banks) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 123, 1841 (New Holland). (From Banks manuscript.)

Rhinobatus tuberculatus MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, pt. 1, p. 12, 1883 (type locality: Port Jackson). (Name only.)

Rhinobatus vincentianus HAACKE, Zool. Anz., vol. 8, pp. 488, 508, 1885 (type locality: St. Vincents Gulf, South Australia).

Rhinobatos vincentianus FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (compiled).

Rhinobatus philippi (part) GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 278, 1913 (Australia).—WAITE, Rec. South Australian Mus., vol. 2, p. 27, fig. 38, 1921.

Depth 16¼ to subcaudal origin; head 3⅕ to 3⅗; disk width 1¼ to 1⅓ its length. Snout 1⅓ to 1⅖ in head, long, tapers to point; eye 7¾ to 10½ in head, 5½ to 9⅖ in snout, 2⅕ to 3⅕ in interorbital; dentary width 3¾ to 4 in head, with 3 very short or rudimentary grooves at each angle; teeth in 30 to 34 rows in jaws, 80 to 84 rows with age, smooth, rhombic; nostrils moderate, length 2⅖ in dentary width or nearly 1 to 1⅛ in internarial width; front nasal valve reaches halfway from its lobe to inner edge of nostril and very little turned forward at end; hind nasal valve larger and outer section much shorter than inner; interorbital 3⅖ to 4⅖ in head, depressed, or nearly level medially, orbital edge elevated little anteriorly and above spiracles. Gill openings subequal, equidistant. Spiracle large, deep, close behind eye and without fold on hind edge.

Body rather rough, tubercles all rather large, 2 or 3 before each eye, 1 or 2 above spiracle and 23 principal large vertebral tubercles before first dorsal, also 3 interdorsal vertebral ones besides 2 well spaced at shoulder. Tubercles inconspicuous with age.

First dorsal broad, front edge 2⅞ to 3⅕ in head; second dorsal similar, 3 to 3⅕ in head; caudal 2⅛ to 2⅖, subcaudal without lobe, moderately low; pectoral broader posteriorly; ventral length 1⅞ to 1⁹⁄₁₀ in head.

Back largely uniform brown, pale or creamy translucent space each side of snout. Under terminal portion of snout, also its margins each side back opposite nostril, besides rostral cartilages, blackish. Rest of under surface whitish.

Queensland, New South Wales, South Australia, New Zealand. The large vertebral and shoulder tubercles, besides the blackish lower surface of the snout are very characteristic. One seen in the Queensland Museum from Southport.

U.S.N.M. No. 40033. Port Jackson. Australian Museum. Length, 247 mm.

U.S.N.M. No. 29015. No locality. Australian Museum. Head and body partly skinned out 930 mm. long. Under surface of snout with suffused dusky to blackish.

APTYCHOTREMA BOUGAINVILLII (Müller and Henle)

Rhinobatus (*Syrrhina*) *bougainvillii* (Valenciennes) Müller and Henle, Syst. Beschr. Plagiostomen, p. 117, 1841 (locality unknown).—Gray, List fish British Museum, p. 95, 1851 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 491, pl. 10, fig. 1 (snout), 1865 (type).

Rhinobatus bougainvillii Günther, Cat. Fishes British Mus., vol. 8, p. 445, 1870 (compiled).—Ogilby, Proc. Linn. Soc. New South Wales, vol. 10, p. 464, 1885 (New South Wales; Cape York); Cat. Fishes Australian Mus., pt. 1, p. 15, 1888 (Port Jackson, Parramatta River).—Waite, Mem. Australian Mus., vol. 4, p. 38, pl. 3, 1899 (off Cape Hawk to Shoalhaven Bight, in 10 to 48 fathoms).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 277, 1913 (Port Jackson).

Rhinobatos bougainvillii Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 498, 1930 (reference).

Aptychotrema bougainvillii Norman, Proc. Zool. Soc. London, 1926, p. 978, text fig. 29 (rostra) (Port Jackson).

Depth 13 to 16 to subcaudal origin; head 3⅗ to 5⅕; disk width 1¼ to 1⅓ its length. Snout 1½ to 1⅔ in head, long, tapers to point; eye 7 to 10¼, 4⅕ to 7 in snout, 2⅖ to 2⅗ in interorbital; dentary width 3 to 3⅔ in head with 2 very short labial folds at each mouth angle; teeth in 50 rows in jaws, nearly smooth or with very low cusp to each tooth, rhomboid; nostrils moderate, ⅓ of dentary width or 1⅖ in internarial width; nasal valves moderate, anterior rather slender curved flap; posterior valve of similar size, extends little beyond middle of nostril, flaps rather small with inner little broader or larger than outer; interorbital 2¾ to 3⅘ in head, depressed or level medially, elevated supraorbital ridges. Gill openings equidistant, nearly subequal. Spiracle deep, close behind eye, hind edge with low fold.

Scales very fine, smooth to touch. Spines all short and only one to several inconspicuous before eye or above spiracles and about 28 inconspicuous larger in vertebral row to first dorsal, few more inconspicuous in interdorsal vertebral row besides 2 widely separated low short spines at each shoulder.

First dorsal with front edge 2⅘ to 3 in head, rather broad; second dorsal similar, front edge 2⅘ to 3; caudal 1⅘ to 2⅛, subcaudal without lobe, moderately low; pectoral moderately wide; ventral

1⅗ to 1⅔; claspers narrow, slender, reach ¾ to hind ventral ends. Uniform brown above, paler to whitish below.

Queensland, New South Wales. Related to *Rhinobatos philippi* but differs in its much smoother body, especially in the comparatively inconspicuous vertebral and shoulder tubercles.

U.S.N.M. No. 40030. Port Jackson. Australian Museum. Length, 167 to 170 mm. 4 examples.

U.S.N.M. No. 84371. Queensland. *Endeavour* collection. Length, 455 mm. As *Rhinobatus banksii.*

U.S.N.M. No. 39984. Port Jackson. Australian Museum. Length, 845 mm.

U.S.N.M. No. 39986. Port Jackson. Australian Museum Length, 805 mm.

Genus TRYGONORRHINA Müller and Henle

Trygonorrhina MÜLLER and HENLE, Ann. Mag. Nat. Hist. Charlesworth, new ser., vol. 2, p. 90, 1938. (Atypic: Type, *Trygonorhina fasciata* Müller and Henle.)

Trygonorhina MÜLLER and HENLE, Beschr. Plagiostomen, p. 124, 1841. (Type, *Trygonorhina fasciata* Müller and Henle, monotypic.)

Trigonorhina GRAY, List fish Brit. Mus., p. 98, 1851. (Type, *Trygonorhina fasciata* Müller and Henle.)

Trigonorrhina GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 287, 1913. (Type, *Trygonorhina fasciata* Müller and Henle.)

Disk wide, shorter than tail. Tail not broad at base, moderately slender. Rostral cartilages strong, wide at fontanel, tapering blunted. Nasal valves confluent in wide quadrangular flap, forming front edge of mouth, free on lateral edges behind nostrils. Spiracle large, close to eye, with fold. Dorsals remote from ventral bases. Subcaudal not lobed. Pectorals not extended in front of nostrils. Ventral origins close to pectoral axils.

One species in Australia. Fossils known from the Middle Eocene.

TRYGONORRHINA FASCIATA Müller and Henle

Trygonorhina fasciata MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 124, 1841 (type locality: New Holland). (On Banks manuscript).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 502, 1865 (West Australia; types).—GÜNTHER, Ann. Mag. Nat. Hist., ser. 3, vol. 20, p. 67, 1867 (New South Wales ?); Cat. Fishes British Mus., vol. 8, p. 448, 1870 (Tasmania, South Australia, New South Wales, Sydney).—CASTELNAU, Proc. Zool. Soc. Victoria, vol. 1, p. 223, 1872 (Melbourne market).—HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 82, 1872 (compiled).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Port Mackay).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 309, 1880 (Tasmania, Victoria, South Australia, New South Wales).—JOHNSTON, Proc. Roy. Soc. Tasmania, 1882, p. 140, 1883.—HASWELL, Proc. Linn. Soc. New South Wales, vol. 9, p. 107, pl. 2, figs. 1–5 (skeleton), 1884.—OGILBY, Cat. Fishes New South Wales, p. 5, 1886; Cat. Fishes Australian Mus., pt. 1, p. 15, 1888 (Port Jackson).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 45, 1890 (south part of Port Phillip).—JOHNSTON, Proc. Roy. Soc. Tasmania, 1890, p. 39, 1891.—HILL, Proc. Linn. Soc. New South Wales, ser. 2, vol. 10,

p. 206, pl. 20, 1895 (abnormality).—WAITE, Prelim. Rep. *Thetis* Exp., p. 39, 1898 (north to Manning Bight, New South Wales); Mem. New South Wales Nat. Club, no. 2, p. 9, 1904.—ZIETZ, Trans. Roy. Soc. South Australia, vol. 32, p. 292, 1908.—MCCULLOCH, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, pl. 38, figs. 1–2, 1921.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 499, 1930 (reference).

Trygonorrhina fasciata MÜLLER and HENLE, Syst. Beschr. Plagiostomen, pl. 43, 1841.—STEAD, Fishes of Australia, p. 233, 1908.—MCCULLOCH, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 460, 1921 (off Sandon Bluff and Port Jackson).—WAITE, Rec. South Australian Mus., vol. 2, p. 27, fig. 39, 1921.—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 10, pl. 2, fig. 31a, 1927.

Trigonorhina fasciata GRAY, List fish British Museum, p. 98, 1851 (South Australia).

Trigonorrhina fasciata GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 287, 1913 (Australia and Tasmania).

?*Rhinobatus fasciatus* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816 (name only).

Raja fasciata (Banks) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 124, 1841 (name in synonymy).

Trygorrhina fasciata guanerius WHITLEY, Rec. Australian Mus., vol. 18, p. 327, 1932 (type locality: Glenelg, South Australia; compared with Melbourne, Port Jackson, and New South Wales materials).

Depth $8\frac{1}{3}$ to $9\frac{7}{8}$ to subcaudal origin; head $3\frac{4}{5}$ to 4; disk width $1\frac{1}{10}$ to $1\frac{1}{5}$ in its length. Snout $1\frac{2}{3}$ to $1\frac{3}{4}$ in head; eye $6\frac{4}{5}$ to $8\frac{1}{3}$, 4 to $5\frac{1}{3}$ in snout, 3 to $4\frac{1}{5}$ in interorbital; dentary width $2\frac{3}{5}$ to $2\frac{3}{4}$ in head, with short groove at each mouth angle; teeth in 50 rows in jaws, smooth, rhombic; nostrils moderate, anterior valves connected across internarial space concealing posterior valves besides greater part of each nostril, reaching mouth; internarial little wider than dentary width; interorbital $2\frac{1}{5}$ to $2\frac{1}{3}$ in head, depressed concavely medially. Gill openings equidistant, small, short, last shortest. Spiracle nearly large as eye, close behind eyeball as deep pit.

Several small tubercles before and above eye, also several above spiracle; row of 16+1 to 3 vertebral eubtrcles; 2 groups of 2 or 2 or 3 on each shoulder.

First dorsal higher than long, front edge $2\frac{1}{5}$ to $2\frac{1}{3}$ in head; second dorsal similar, 2 to $2\frac{2}{5}$ in head; caudal $1\frac{1}{2}$, without subcaudal lobe; pectoral rather large; ventral length $1\frac{1}{3}$ to $1\frac{3}{5}$ in head.

Light or dark brown, with transverse rib like grayer bands on disk, several of which may cross back. All bands defined by dark bordering lines, much broader in young. With age dark bordering bands may break as bars or bands on back. Lower surface pale or uniform.

West Australia, New South Wales, Tasmania, New Zealand.

U.S.N.M. No. 40031. Port Jackson. Australian Museum. Length, 218 mm.

U.S.N.M. No. 84373. New South Wales. *Endeavour* collection. Length, 395 mm.

U.S.N.M. No. 29014. Port Jackson. Australian Museum. Length, 960 mm.

U.S.N.M. No. 39996. Paramatta River, New South Wales. Australian Museum. Length, 583 mm.
U.S.N.M. No. 29012. Locality ? Donor ? Length, 670 mm.; skinned out.
U.S.N.M. No. 29013. Locality ? Donor ? Length, 780 mm.; skinned out.
U.S.N.M. No. 39995. Paramatta River. Australian Museum. Length, 465 mm.

Family PLATYRHINIDAE

Disk large, wide, circular. Tail rather slender, axis not raised, fold along each side. Snout broad, blunt. Nostrils nearly transverse; valves variable; nasoral grooves rudimentary or absent. Dorsals two, far behind ventrals. Caudal moderately long, subcaudal without lobe and nearly equals supracaudal. Pectorals wide, rounded, extend forward to snout end. Claspers unsegmented.

Genera few, oviparous or viviparous.

ANALYSIS OF GENERA

a^1. Platyrhininae. Rostral cartilages present; two dorsals.
  b^1. Rostrum extends to end of snout, pointed; front nasal valves joined across interspace ---------- Zanobatus
  b^2. Rostrum short, wide, not half length of snout; front nasal valve not joined across internarial space ---------- Platyrhina
a^2. Arhynchobatinae. Rostral cartilages absent; one dorsal fin. Arhynchobatis

Genus ZANOBATUS Garman

Zanobatus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 291, 1913. (Type, *Platyrhina schoenleinii* Müller and Henle, monotypic.)

Disk wider than long, partly rounded. Tail slender, nearly half total length. Snout short, blunt, rostral cartilages small and gradually tapering. Nostrils transverse, narrow, interspace wide; front valves confluent, hind ones with inner portion large, reaching mouth. Spiracles large, without fold. Fins rounded. Dorsals small, far behind ventrals. Caudal small, rounded. Pectorals very wide, separated at end of snout. Ventrals close to pectorals.

India.

ZANOBATUS SCHOENLEINII (Müller and Henle)

Platyrhina schoenleinii Müller and Henle, Syst. Beschr. Plagiostomen, p. 125, pl. 45, 1841 (type locality: India).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 82, 1853 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 577, 1865 (India).—Günther, Cat. Fish. Brit. Mus., vol. 8, 1870, p. 471 (compiled).—Day, Fishes of India, pt. 4, p. 735, 1878 (Madras Museum); Fauna British India, Fishes, vol. 1, p. 47, 1889.

?*Platyrhina schoenleini* Steindachner, Denkschr. Akad. Wiss. Wien, vol. 44, p. 50, pl. 7, 1882 (Goree).

Discobatus schönleinii Garman, Proc. U. S. Nat. Mus., vol. 3, p. 523, 1880 (India; reference).

Zanobatus schoenleini Garman, Mem. Mus. Comp. Zool., vol. 36, p. 291, 1913 (compiled).

Head to hind spiracle edge 5⅔ in total length. Snout 1½ in head to hind spiracle edge; orbit 5⅞, 3¼ in snout, 1½ in interorbital; mouth width 2⅖ in head to first gill opening; teeth very small; nostrils short, each 2¼ in internasal, which 3¼ in head to first gill opening; front valves continuous across internarial space, hind valve with inner flap wide as combined outer flap and lobe, extend near though not quite to mouth angle; interorbital 3¼ in head to hind spiracle edge. Spiracles entire, close behind orbit and 1¼ in orbit.

Scales variably minute or larger. Small tubercles above rostral cartilages, orbital ridges, basal pectoral cartilages and entire vertebral series to dorsal.

First dorsal origin about midway between hind ventral ends and second dorsal origin, fin 2⅛ in head to hind spiracle edge; second dorsal 2⅙; caudal 1⅗, no subcaudal lobe, fin rounded; pectorals form subcircular disk with blunt snout tip in front, length 1⅙ in rest of body, 1⅙ in its width; ventrals obtuse.

Above and below brown, upper surfaces with darker transverse bands and between toward pectoral edges scattered dark spots. Below body with irregular large dark blotches. (Müller and Henle.)

India. Also reported from West Africa by Steindachner. His specimen was about 400 mm. long and according to his figure is a little differently marked, the dark blotches on the pectorals greatly larger toward bases of fins and tail with broad dark bands bordered with smaller ones. Duméril gives 473 mm. length for the specimen in the Berlin Museum.

Genus PLATYRHINA Müller and Henle

Platyrhina Müller and Henle, Mag. Nat. Hist., vol. 2, p. 90, 1838; Beschr. Plagiostomen, p. 125, 1841. (Type, *Rhina sinensis* Schneider, selected by Bonaparte, Ann. Sci. Nat., Bologna, vol. 2, p. 205, 1838.) (*Platyrhinus* Schellenberg 1798 not involved.)

Narcopterus Agassiz, Poissons fossiles, vol. 3, p. 382, 1843. (Type, *Narcopterus bolcanus* Agassiz, monotypic. No description.) (Fossil.)

Analithis Gistel, Naturg. Thierreichs, p. x, 1848. (Type, *Rhina sinensis* Schneider, virtually. *Analithis* Gistel proposed to replace *Platyrhina* Müller and Henle.)

Disk subcircular to subtriangular, with broadly rounded angles. Tail slender, about half total length. Rostral cartilages short, wide, not extended half space from skull to snout end, truncate and supplemented by soft prolongations, somewhat as in *Torpedo*. Eyes small. Nostrils nearly transverse, connected with mouth by deep groove; front narial valves extended upon but not crossing internarial space. Spiracles close to eyes, with cartilage each side, without folds. Dorsals far behind ventrals, small, rounded. Caudals about equal, truncate; subcaudal not lobed. Pectorals very wide, form snout end, where rather narrowly separated. Ventrals close to pectorals.

China, Japan.

PLATYRHINA SINENSIS (Schneider)

Rhina sinensis SCHNEIDER, Syst. Ichth. Bloch, p. 352, 1801 (on *La raie chinoise* Lacépède, Hist. Nat. Poiss., vol. 1, pp. 34, 157, pl. 2, fig. 1, 1798, type locality: China=from Chinese drawing).

Narcobatus sinensis BLAINVILLE, Bull. Soc. Philomath. Paris, vol. 8, p. 121, 1816 (name only).

Platyrhina sinensis MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 125, pl. 44, 1841 (Japan, China).—RICHARDSON, Ichth. China, Japan, p. 186, 1846 (Seas of China; Canton).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 50, 1852 (reference); (Japan), vol. 25, p. 22, 1853 (Japan, China, East Indies).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 576, 1865 (Tourane, Cochin China.)—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 171, 1870 (China).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 41, 1901 (Japan).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 109, 1925 (Mikawa Bay and Sagami Bay).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 597, 1930 (Hongkong); Hong Kong Nat., vol. 1, p. 134, fig. 17, 1930 (Japan).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 259, fig. 20, 1932 (Tsingtau).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 103, 1933 (Chusan).—FOWLER, List Fish. Malaya, p. 13, 138 (reference).

Discobatus sinensis GARMAN, Proc. U. S. Nat. Mus., vol. 3, p. 523, 1880 (China; reference).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Wakanoura; Hiroshima).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Tokyo).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 289, pl. 56, fig. 8 (heart), pl. 66, 1913 (Japan).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 187, 1920 (Boshiu).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 499, 1930 (Japan).—LIN, Sci. Rep. Nat. Tsing Hua, Univ., ser. B, vol. 1, No. 5, p. 138, text-figs. 7–7a, pl. 2, fig. 4 (scales), pl. 5, fig. 12 (teeth), 1932 (Tsingtao).—TANAKA, Jap. Fish. Life Colours, No. 30, 1933.

Discobatis sinensis PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 647, 1908 (Japan).

Depth 11⅗ to 17¾ to end of tail; head 4¼ to 4¾; disk length 1⅙ to 1⅕ its width (width 1⅛ in its length with age), little greater than tail, with age tail subequal to slightly longer. Snout 1⅓ to 1¾ in head, ends in slight point formed by broadly obtuse angle; eye 7 to 10, 4½ to 6½ in snout, 3 to 4 in interorbital; dentary width 3 to 3⅗ in head, subequal with internarial; teeth in 48 rows in jaws, 92 rows with age; nostrils small; front nasal valve with feeble outer section, lobe strong, moderate inner section extended somewhat on internarial; hind nasal valve with outer section large, curves around outer end of nostril; interorbital 2⅖ to 2½ in head, depressed concavely. Gill openings small, equidistant, last shortest. Spiracle wide, little larger than eye and close behind.

Skin largely smooth. Dermal fold along each side of tail. Above eye 4 or 5 tubercles, 2 or 3 in median row at front of back and median vertebral series on tail 12 to 23 to first dorsal.

First dorsal length 3⅓ to 3½ in head; second dorsal length 2 to 3¼; caudal small, shorter than either dorsal, longer with age; pectoral broad, forms subcircular disk, outer edges widely convex; ventrals broad, hind edges deeply notched; claspers broad, end in obtuse points, length ⅔ hind ventral edges.

Brown above, with pale translucent space each side of and between rostral cartilages. Often disk darker medially and sometimes dark blotch on pectorals basally and posteriorly. Under surfaces whitish, with outer margins of pectorals and ventrals broadly brownish.

China, Japan. My young examples do not show the "scattered enlarged granules above the body cavity, around each of the twenty or more small tubercles in the vertebral series, around each of those in the two pairs on each shoulder, in the pair above each spiracle and around each of the single ones at the front of the orbit. Small tubercles in four or five series, the larger sharper granules appear along the outer edges of the anterior half of the pectorals," as described by Garman. These are all features with age.

U.S.N.M. No. 51295. Tokyo. Jordan and Snyder. Length, 680 mm.

U.S.N.M. No. 71736. Tokyo market. *Albatross* collection. Length, 220 to 230 mm. 2 examples.

PLATYRHINA LIMBOONKENGI Tang

Platyrhina limboonkengi TANG, Lingnan Sci. Journ., vol. 12, No. 4, p. 561, pl. 42, figs. 1–2, 1933 (type locality: Amoy, China).

Disk subcircular, broader than long. Snout obtuse, preorbital length 2 or more times space between spiracles; preoral length 2⅓ times mouth width. Rostral cartilage reduced, not reaching end of snout. Eye 8 to 9 in preorbital length of snout; eye and spiracle 2 in space between spiracles. Nostril connected with mouth by groove, length equals or slightly longer than internarial width; front nasal valves expanded, partly covering inner part of nostrils and not joined across internarial space. Mouth slightly arched, no elevations or depressions on jaws. Teeth small, in pavement, 82 to 88 rows in lower jaw, each with short median keel.

Most of disk densely covered with prickles, especially on snout, its anterior margins and center of back and tail surrounding spines. Each supraorbital ridge with 3 or more spines; 2 pairs on shoulder and 3 smaller on lateral border; row on median line of back to ventral bases, sometimes down to tail; 2 rows on tail and 2 pairs between dorsals.

First dorsal twice high as long, origin nearer caudal than ventral origin, reaching or almost reaching second dorsal origin. Interdorsal space 3⅗ to 5⅖ in space between hind base of ventral and first dorsal origin. Second dorsal 1$\frac{7}{10}$ to 2 in height, reaching to or beyond caudal origin. Tail longer than disk, with broad cutaneous fold along each side of tail and reaches caudal base.

Color uniform brown, with pale anterior margin. White below.

Length, 406 to 517 mm., width of disk, 197 to 269 mm. (Tang.)

China. Related to *Platyrhina sinensis*, which differs in the shorter snout, space between spiracles less than 2 in preorbital, first dorsal origin nearer ventral base than caudal origin, longer interdorsal space 2½ to 3 in space between ventral base and first dorsal origin; first dorsal fin ⅗ interdorsal space; smooth teeth granular; prickles fewer; only 3 spines on each supraorbital ridge, 2 pairs on shoulder but without smaller ones on its lateral border, single row on back and tail, 2 on interdorsal space; spines in cephalothoracic region embedded in whitish or light yellow spots.

Genus ARHYNCHOBATIS Waite

Arhynchobatis WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 20, 1909. (Type, *Arhynchobatis asperrimus* Waite, montypic.)

Body and head depressed as rounded disk, little shorter than tail. Tail long, depressed, slender, with fold each side. Cranium without cartilaginous rostral prolongation. Each nostril with two valves, anterior tubelike, posterior triangular and latter pair joined medially. Skin with small spines or thorns. One dorsal, near end of tail. Caudal well developed. Pectorals continuous in front, modified to form small nasal tip. Ventrals distinct from pectorals, deeply notched.

ARHYNCHOBATIS ASPERRIMUS Waite

Arhynchobatis asperrimus WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 150, pl. 20, 1909 (type locality: Bay of Plenty, New Zealand, in 66–94 fathoms); vol. 1, No. 4, p. 316, 1912 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 292, 1913 (compiled).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 499, 1930 (reference).

Head to hind spiracle edge 6⅗ in total length. Snout 1⅓ in head to hind spiracle edge; orbit 4¼, 3⅛ in snout, 2½ in interorbital; mouth width 1⅓ in snout, but slightly undulated; teeth small, without cusps; nasal flap triangular, deeply notched medially to form 2 triangles, each slightly fimbriate at apex; interorbital 1⅘ in head to hind spiracle edge. Spiracle close behind eye, posterior edge of valve pilose. Gill openings moderate, convergent posteriorly.

Skin everywhere covered with closely set spines; thorns in area between eyes and spiracles, hind ones largest; transverse patch of large thorns on humeral region, median row extended forward short space; tail with row of strong conic thorns in midline and several irregular series of smaller ones each side extending forward into pelvic region;

no spine between dorsal and caudal; whole body and tail below smooth, without pores.

Dorsal terminal on long tail, distant from caudal space equal its own base, small or about long as orbit; caudal 1⅔ in interorbital; pectorals form nearly circular disk which long as tail, length 1⅛ in its own width; ventrals deeply notched, each separately attached to lower side of tail.

Uniform pale purplish gray above, below deep yellow. Length, 640 mm. (Waite.)

New Zealand.

Family TORPEDINIDAE

Head and trunk smooth, depressed, partly circular disk. Tail short, with lateral fold each side and base wide. Rostrum short, more or less branching. Front orbital cartilages extended forward to support disk edges. Front nasal valves reaching mouth, confluent, somewhat free, as lip behind median attachment. Electric organ of vertical cells, modified from ampullae, on each side of head and separating pectoral. Gill openings small, between electric organs and head. Spiracles present. Skin soft and naked. Lateral line rudimentary, on lower side of disk as vesicles of Savi. Dorsals two, one, or none. Caudal not lobed.

ANALYSIS OF GENERA

- a^1. TORPEDININAE. Two dorsals.
  - b^1. Tail long.
    - c^1. Disk subcircular, medium; tail with lateral folds; ventrals distinct.
      - d^1. Nasal flap much broader than long........................ Narcine
      - d^2. Nasal flap only little broader than long................ Heteronarce
    - c^2. Disk elongate; tail without lateral folds; eyes obsolete.... Benthobatis
  - b^2. Tail short.
    - e^1. Disk rather large, elongate; ventrals united.............. Hypnos
    - e^2. Disk rather large, broad, subcircular; ventrals distinct.... Torpedo
- a^2. NARKINAE. One dorsal; disk circular; tail medium, with lateral folds; spiracles entire, close to eye.
  - f^1. Ventrals distinct from pectorals; eyes distinct............ Narke
  - f^2. Front part of ventrals modified for walking, hind part coalesced with disk; eyes rudimentary.................... Typhlonarke
- a^3. TEMERINAE. No dorsal; disk subcircular, longer than tail........ Temera

Genus NARCINE Henle

Narcine HENLE, Über Narcine, p. 31, 1934. (Type, *Torpedo brasiliensis* Olfers, as example by Bonaparte, Ann. Soc. Nat., Bologna, vol. 2, p. 204, 1838.)

Syrraxis (Jourdan) BONAPARTE, Fauna Ital. Pesc., vol. 3, pt. 2, fasc. 13, 1835; fasc. 30 (no pagination), 1841. (Type, *Narcine indica* Henle, montoypic.)

Cyclonarce GILL, Ann. Lyceum Nat. Hist., New York, vol. 7, p. 387, 1862 (Type, *Raja timlei* Schneider, virtually monotypic.)

Goninarce GILL, Ann. Lyceum Nat. Hist., New York, vol. 7, p. 387, 1862 (Type, *Narcine indica* Henle, virtually monotypic.)

Disk subcircular, shorter than tail. Tail moderate, with well-developed lateral folds. Snout strong, produced, rigid with age. Rostral cartilages elongate, stout, broad, trough- or shovel-shaped. Mouth transverse, protractile. Teeth in narrow bands on skin, which loosely attached to jaws. Front nasal valves united in broad, free edged flap reaching mouth; hind valves feebly developed. Spiracles close behind orbits or at short space behind, with or without fringe of papillae. Ventrals distinct, inserted below pectoral ends.

Tropical Atlantic and Indo Pacific.

ANALYSIS OF SPECIES

- *a^1*. Spiracles close behind eye.
  - *b^1*. Spiracles without papillae.
    - *c^1*. Brown, spotted with darker above.
      - *d^1*. First dorsal origin opposite ends of ventral bases---------- **maculata**
      - *d^2*. First dorsal origin little behind ends of ventral bases-------- **timlei**
    - *c^2*. Uniform brown above-- **brunnea**
  - *b^2*. Spiracles with rudimentary papillae---------------------------- **lingula**
- *a^2*. Spiracles at least an orbital diameter behind orbit, without papillae. **tasmaniensis**

NARCINE MACULATA (Shaw)

Raja maculata Shaw, General zoology, vol. 5, pt. 2, p. 316, 1804 (type locality: Indian Seas; on *Temeree* Russell, Fishes of Coromandel, vol. 1, p. 1, pl. 1, 1803, Vizagapatam).

Narcobatus maculata Blainville, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816 (name only).

Narcine maculata Duméril, Rev. Mag. Zool., ser. 2, vol. 4, p. 274, 1852 (Java); Hist. Nat. Elasmobr. vol. 1, p. 518, pl. 11, figs. 2–2a (nostrils, mouth, teeth), 1865 (Java specimen).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

Narcine indica Henle, Über Narcine, p. 35, pl. 2, fig. 2, 1834 (type locality: Tranquebar coast).—Müller and Henle, Syst. Beschr. Plagiostomen, p. 130, 1841 (Tranquebar).—Cantor, Journ. Asiat. Soc. Bengal, vol. 18, p. 1399, 1849 (Sea of Pinang).—Jerdon, Madras Journ. Lit. Sci., vol. 17, p. 148, 1851.—Bleeker, Verh. Batav. Genootsch. (Plagiost.) vol. 24, p. 50, 1852 (Pinang); (Bengal) vol. 25, p. 9, 1853 (on *Temerce* Russell).—Duméril, Rev. Mag. Zool., ser. 2, vol. 4, p. 274, 1852 (Pondichery); Hist. Nat. Elasmobr., vol. 1, p. 517, pl. 11, figs. 2–2a (nostrils, mouth, teeth), 1865 (Pondicherry; type of *Narcine microphthalma*).—Day, Fishes of Malabar, p. 276, 1865.—Garman, Mem. Mus. Comp. Zool., vol. 36, 1913, p. 299, 1913 (Pinang).—Fowler, List Fish. Malaya, p. 14, 1938 (reference).

Narcine microphthalma (Valenciennes) Dumèril, Rev. Mag. Zool., ser. 2, vol. 4. (Pinang).—Fowler, List. Fish. Malaya, p. 14, 1938 (reference).

Disk about half total length, subovate, broader than long, greatest width equals space from snout to vent. Snout moderate, broadly rounded in front; eyes small; mouth small; teeth in 27 rows above, 26 below, small, each acuminate on inner edge; teeth bands narrow, rounded at outer ends; front nasal valves very short, confluent, reaching teeth in median prominence, rounded on outer angles; hind nasal valves in low fold, reach outer side of nostril, extend back from middle in wider fold toward mouth angle. Spiracles much larger than eyes, close behind orbits, without papillae on edges.

Dorsals about equal, upper angles rounded; first dorsal origin above ends of ventral bases, base nearly twice interdorsal; caudal medium, angles rounded; subcaudal rather deep, hind edge obliquely convex.

Brown, with smaller and larger spots of darker. (Garman.)

India, Pinang, East Indies. Duméril gives the length as 330 mm. and Cantor as 455 mm.

NARCINE TIMLEI (Schneider)

Raja timlei SCHNEIDER, Syst. Ichth. Bloch, p. 359, 1801 (type locality: Tranquebar).

Torpedo timlei VAN HASSELT, Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824 (Java).—OLFERS, Torpedo, p. 22, 1831.

Narcine timlei HENLE, Über Narcine, p. 34, pl. 2, fig. 1–1a, 1834 (Tranquebar).—MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 130, 1841 (India, Japan).—RICHARDSON, Ichth. China Japan, p. 196, 1846 (Indian Ocean; Sea of Japan).—GRAY, List fish British Museum, p. 102, 1851 (China Seas).—DUMÉRIL, Rev. Mag. Zool., ser. 2, vol. 4, p. 275, 1852 (Bengal).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 50, 1852 (Java; Celebes); Nat. Tijdschr. Nederland. Indië, vol 4, p. 512, 1853 (Batavia, Java); vol. 20, pp. 217, 447, 1859–60 (Singapore).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 519, 1865 (Bengal; type of *Torpedo macrura*).—KNER, Reise *Novara*, Fische, p. 417, 1865 (Ceylon; Madras).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 452, 1870 (compiled).—BLEEKER, Nederland Tijdschr. Dierk., vol. 4, p. 115, 1874 (Chinese drawing).—DAY, Fishes of India, pt. 4, p. 733, 1878.—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 16, 1888 (Madras).—DAY, Fauna British India, Fishes, vol. 1, p. 45, 1889.—DUNCKER, Mitt. Naturh. Mus. Hamburg, vol. 21, p. 193, 1904 (Singapore).—JORDAN and SEALE, Proc. Davenport Acad. Sci., vol. 10, p. 2, 1905 (Hong Kong).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 44, pl. 3a, figs. 1 (mouth), 1a (teeth), 1909 (Puro, Orissa coast).—PEARSON, Ceylon Administr. Rep., 1912–13, p. E5.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 300, pl. 61, fig. 6 (young), 1913 (China, East Indies, Japan).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, p. E49.—PEARSON, Ceylon Adminstr. Rep., 1915–18, pp. F10–F12.—CHABANAUD, Service Océanogr. Peches Indo-Chine, 1^e Note, p. 6, 1926 (Tonkin).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches, Indo-Chine, 6^e Note, p. 74, 1929 (Cochin China).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference); Hong Kong Nat., vol. 1, p. 137, 1930 (compiled).—HARDENBERG, Treubia, vol. 15, livr. 2, p. 131, 1935 (Bagan Api Api; Batavia).—FOWLER, List Fish. Malaya, p. 15, 1938 (reference).

Narcina timlei JORDAN and SEALE, Proc. Davenport Acad. Sci., vol. 10, pl. 1, 1905 (error).

Narcine microphthalma (Valenciennes) DUMÉRIL, Rev. Mag. Zool., ser. 2, vol. 4, p. 275, 1852 (type locality: Malabar coast, Pondicherry Bay).

Narcinc macrura (Valenciennes) DUMÉRIL, Rev. Mag. Zool., ser. 2, vol. 4, p. 277, 1852 (type locality: Sea of the Indies).

Narcine indica (not Henle) BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 9, 1852 (on *Nalla temeree* RUSSELL, Fishes of Coromandel, vol. 1, p. 2, pl. 2, 1803, Vizagapatam).

Head to hind spiracle edge 2½ in disk length. Snout 1⅙ in head to hind spiracle edge; eye very small, about ½ spiracle; mouth small, protractile; teeth bands narrow, rounded on outer edge; teeth in 23 rows above, 21 below, each with acuminate point on inner edge of crown; front nasal valves short, confluent in broad flap reaching mouth, with 2 slight notches and 3 low prominences on hind border; hind nasal valves feeble, extend to outer side of nostril, continued in a slight fold toward mouth angle; interorbital 2 in head to front edge of spiracle. Spiracle large, close behind eye.

First dorsal origin behind hind basal end of ventral, fin length 1½ in head to hind spiracle edge; second dorsal length 1⅗; caudal 5⅕ in rest of body, rounded; pectorals form subcircular disk, length slightly less than rest of body, wide as long; ventrals 6½ in total body length.

Light brown above, with large round brown spots, larger than interspaces. Under surface white. Length, 180 mm. (Jordan and Seale; Garman.)

China. According to Annandale adults reach 340 mm. He gives the color as chocolate brown above profusely marked with large spots of dark purple brown. In the young these spots surrounded by rather indefinite pale rings, sometimes persisting with age and giving an ocellate appearance. Hind dorsal and caudal edges somewhat broadly and front edges narrowly bordered with white. Ventral surface dead white, sometimes clouded with dark pigment in large individuals. Annandale also says it is very sluggish in its movements and that he failed repeatedly to induce it to give an electric shock even when it was in a bucket of sea water.

NARCINE BRUNNEA Annandale

Narcine brunnea ANNANDALE, Mem. Indian Mus., vol. 2, p. 45, pl. 3a, figs. 2 (mouth), 2a (teeth), 1909 (type locality: Hughli River mouth).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 300, 1913 (compiled).

Narcine timlei (not Schneider) DAY, Fishes of India, pt. 4, pl. 192, fig. 3, 1878; Fauna Brit. India, Fishes, vol. 1, p. 45, fig. 18, 1889.

Narcine firma GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 301, 1913 (type locality: Colombo, Ceylon).

Head to hind spiracle edge 5⅕ to end of tail; disk length 2¼. Snout 1⅓ in head to hind spiracle edge; eye very small, about half of spiracle; posterior projection of teeth much shorter than transverse diameter of base, rather broad and blunt; mouth roof behind teeth with cutaneous ridge bearing irregular serrations, on mouth floor similar ridge with or without median notch but not divided as 2 distinct processes; free edge of nasal flap with distinct median projection; interorbital 3 in head to hind spiracle edge. Spiracle large, equals interspiracular space.

First dorsal inserted entirely behind ventral, length 2 in head measured to hind spiracle edge; second subequal with first, interdorsal space about 1¾ in second dorsal length; caudal 1⅓ in head to hind spiracle edge; pectorals form slightly ovate disk, about wide as long; ventral about ⅓ pectoral length.

Above warm chocolate brown, without spots, under surface creamy white. Narrow cream white edge around disk, more distinct anteriorly. Dorsals and caudals edged gray white. Length, 220 mm. (Day; Annandale.)

India. *Narcine firma* is based on an example 432 mm., with "colors too faded for description," and would appear to represent advanced age. The characters Garman gives, such as the first dorsal having its basal length behind ventral bases, caudal obliquely rounded, and rostral ridges nearly parallel, do not seem to me sufficient.

NARCINE LINGULA Richardson

Narcine lingula Richardson, Ichth. China Japan, p. 196, 1846 (type locality: China).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 516, 1865 (copied).—Günther, Cat. Fishes British Mus., vol. 8, p. 452, 1870 (China).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 298, 1913 (China).—Chabanaud, Service Océanogr. Pêches Indo-Chine, 1^{e} note, p. 6, 1926 (Cochinchina).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^{e} note, pp. 74, 175, 1929 (Cochinchina).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference); Hong Kong Nat., vol. 1, p. 137, 1930 (compiled).—Lin, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 158, figs. 8–8a, pl. 3, fig. 6 (tooth) 1932 (Tsingtao?).

Disk less than half total length, broad, subovate, nearly round, slightly narrowed and edges straighter opposite head, wider than long. Snout strong, broadly rounded in front; eyes small; mouth protractile; teeth bands moderate, semicircular on outer edges; teeth in 25 rows in each jaw, small, each with prominent acuminate cusp on inner edge of crown; front nasal valves confluent in broad flap, free on hind edge, reaching teeth in rounded prominence, angles rounded; hind nasal valves quite rudimentary, absent around uncovered portion of nostril, slightly developed in thin fold back from middle of nostril toward mouth angles; crown convex transversely. Spiracles larger than eyes, close behind orbit, with rudimentary papillae on margins.

Dorsals subequal, rather pointed, bases wider than fins; first dorsal origin little behind ends of ventral bases, space from second more than half of base; caudal longer than deep, vertically truncate.

Rusty brown, with irregular small and larger spots, largest along middle of back. White beneath. Length, 330 mm. (Garman.)

China.

NARCINE TASMANIENSIS Richardson

Narcine tasmaniensis Richardson, Proc. Zool. Soc. London, 1840, p. 29 (type locality: Port Arthur and Hobart Town, Tasmania); Trans. Zool. Soc. London, vol. 3, p. 178, pl. 11, figs. 2, 2a–b, 1841 (Port Arthur).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 517, 1865 (compiled).—Günther, Cat. Fishes British Mus., vol. 8, p. 452, 1870 (type).—Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 223, 1872 (Bass Straits and Hobart Town).—Macleay, Proc. Linn. Soc. New South Wales, vol. 5, p. 310, 1880 (Tasmania); vol. 6, p. 374, 1881 (Tasmania).—Lucas, Proc. Roy. Soc. Victoria, new series, vol. 2, p. 45, 1890 (St. Kilda beach).—Waite, Mem. Australian Mus., vol. 4, p. 41, 1899 (off Wata Mooli, New South Wales, in 70 to 78 fathoms).—McCulloch, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 14, 1911 (Bass Strait).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 301, 1913 (Tasmania).—McCulloch, Fishes New South Wales, ed. 2, pl. 3, fig. 34a, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

Head to first gill opening 5⅖ in total length. Snout 2⅕ in head to first gill opening; eye 9½, 4⅔ in snout, 3¾ in interorbital; mouth width 4⅛ in head to first gill opening, protractile; teeth bands narrow, angular on outer border; teeth in about 12 or 13 rows, each with acute point on inner edge of crown; front nasal valves confluent in wide flap, form obtuse lobe on side of each nostril, internarial 3⅗ in head to first gill opening; interorbital 2⅘, nearly level. Spiracle at least orbital diameter behind orbit, which 1¼ in spiracle.

Origin of first dorsal above hind basal ends of ventrals, fin length 1⅗ in head to first gill opening; second dorsal length 1⅔; caudal 4½ in rest of body; pectorals form broadly ovate disk, length 1⅙ its width or 2⅔ in total length; ventral 5⅘, obtuse.

Above uniform yellowish brown, below pale. Length, 367 mm. (Richardson.)

New South Wales, Victoria, Tasmania.

Genus HETERONARCE Regan

Heteronarce Regan, Ann. Mag. Nat. Hist., ser. 9, vol. 7, p. 414, 1921. (Type, *Heteronarce garmani* Regan, monotypic.)

Nostrils minute. Nasal flap only little broader than long, studded with pores. Spiracles contiguous with eyes. Dorsals two.

Indian Ocean.

ANALYSIS OF SPECIES

a^1. Spiracles large, each ⅔ their interspace; disk slightly more than half total length .... mollis

a^2. Spiracles small, each ⅓ their interspace; disk less than half total length. garmani

HETERONARCE MOLLIS (Lloyd)

Narcine mollis Lloyd, Rec. Indian Mus., vol. 1, p. 5, 1907 (type locality: Lat. 13°36′00″ N., long. 47°32′00″ E., Arabian Sea, in 130 fathoms); p. 8, 1907 (Gulf of Aden).—Annandale, Mem. Indian Mus., vol. 2, pl. 3a, figs. 3 (mouth), 3a (teeth), 1909.—Lloyd, Mem. Indian Mus., vol. 2, p. 144, 1909 (type); Illustr. Zool. *Investigator*, Fishes, pl. 46, figs. 1–1a, 1909 (type).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 302, 1913 (compiled).

Head to spiracle 7⅗ to end of tail; disk length 1⅞. Snout 1⅖ in head to spiracle; orbit 3⅓, 2⅓ in snout, 1⅗ in firm part of interorbital; mouth width 1⅓ in head to spiracle; teeth in 10 to 12 rows in both jaws, front ones with triangular flat surfaces, hind ones with sharp median cusp; nasal flap length 1⅔ in internarial; interorbital over firm area 2 in head to spiracle. Spiracle close behind and equals eye. Round disk margin, along sides of tail, over snout, openings of mucous pores symmetrically arranged.

First dorsal inserted just behind ventrals, length 1⅕ in head to spiracle; second dorsal length 1⅛; caudal 4⅒ in rest of body length; rounded pectorals form evenly rounded broad ovoid disk, width equal to its length; ventrals not notched; vent slightly nearer front snout edge than tip of tail.

Dark brown above, grayish brown below. (Lloyd.)

Arabian Sea.

HETERONARCE GARMANI Regan

Heteronarce garmani Regan, Ann. Mag. Nat. Hist., ser. 9, vol. 7, p. 414, 1921 (type locality: Natal).—Gilchrist, Marine Biol. Surv. South Africa, Spec. Rep. pt. 3, p. 50, 1922 (off Durban).—VonBonde and Swart, Marine Biol. Surv. South Africa Rep. pt. 3, 1922, p. 4, 1924 (compiled).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 92, 1925 (Natal, in 120 fathoms); pt. 2, p. 1016, 1927 (note).

Narcine garmani Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 193 (type of *Narcine natalensis*).

Heteronarce regani VonBonde and Swart, Marine Biol. Surv. South Africa Rep. pt. 3, 1922, p. 14, pl. 22, fig. 2, 1924 (type locality: off Natal, in 115 to 180 fathoms).

Narcine natalensis Fowler, Ann. Natal Mus., vol. 5, pt. 2, p. 198, fig. 2, 1925 (type locality: East London).

Head 5⅓ in total length. Snout to eye 8½ in total length; eye 5 in snout, 3 in interorbital; mouth small, nearly straight, width 3 in snout; preoral length 8 in total length; front narial valves short, within small flap covering mouth, hind edge of which irregular; interorbital 1⅙ in snout, depressed, orbital edges elevated so eyes protrude.

First dorsal length 1⅒ in snout; second dorsal length 1; caudal 1⅕ in head; pectorals form subcircular disk, wide as long, width $1\frac{9}{10}$ in total length; outer ventral edges convex.

Uniform brown above, edges of disk not narrowly white. Under surface of body cream white.

Natal.

Although *Heteronarce regani* is based on an example 190 mm. long, there is little in the original description to contend for its separation as a distinct species. Its caudal is described with the "lower margin broadly rounded, hind margin oblique, slightly sinuous." The figure shows the hind caudal edge truncate.

1 example, A.N.S.P. East London, South Africa, in 40 fathoms. H. W. Bell Marley. Length, 260 mm. Type of *Narcine natalensis*.

Genus BENTHOBATIS Alcock

Benthobatis Alcock, Ann. Mag. Nat. Hist., ser. 7, vol. 2, p. 144, 1898. (Type, *Benthobatis moresbyi* Alcock, monotypic).

Disk little longer than broad. Tail distinct, longer than disk, without lateral folds. Snout more than one-third of disk. Eyes small, rudimentary. Mouth small, protractile. Teeth in bands. Front nasal valves confluent in quadrangular flap. Upper lip distinct. Electric organ between head and pectoral. Spiracle moderate, close behind eyes. Skin soft, smooth. Two dorsals. Caudal well developed.

Rays of the deeper waters of the Bay of Bengal and the Gulf Stream.

BENTHOBATIS MORESBYI Alcock

Benthobatis moresbyi Alcock, Ann. Mag. Nat. Hist., ser. 7, vol. 2, p. 145, 1898 (type locality: Off Travancore coast in 430 fathoms); Illustr. Zool. *Investigator*, pt. 4, pl. 26, fig. 1, 1896; Cat. deep sea fishes *Investigator*, p. 18, 1899 (types).—Lloyd, Rec. Indian Mus., vol. 1, p. 4, 1907 (lat. 15° 55′ 30″ N., long. 52° 38′ 30″ E., in 585 fathoms, Arabian Sea).—Annandale, Mem. Indian Mus., vol. 2, pl. 3a figs. 5 (mouth), 5a (teeth), 1909.—Lloyd, Mem. Indian Mus., vol. 2, p. 145, 1909 (reference).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 294, 1913 (compiled).

Head $4\frac{4}{5}$ to end of body; disk $2\frac{1}{8}$. Snout $2\frac{2}{3}$ in disk length; eyes 2 very small unpigmented spots, size of pin head; mouth small, protractile; teeth small rhomboid plates, posterior angle strongly and acutely extended, arranged in mosaic in about 10 very oblique series in either jaw; interorbital $5\frac{2}{5}$ in disk length. Gill openings large, well spaced, last nearer vent than mouth. Spiracle large, $3\frac{1}{5}$ in interspiracular space, which $2\frac{2}{5}$ in snout.

First dorsal inserted little before hind limit of ventrals, length $3\frac{2}{5}$ in disk; second dorsal $3\frac{2}{3}$; caudal $2\frac{2}{5}$, end obtuse; pectorals form elongate disk, width $1\frac{1}{3}$ its length; ventrals separate, not notched.

Purplish black; scattered on disk and marginally some small white pores, not much smaller than eyes. Tips of second dorsal and caudal sometimes white. Length, 357 mm. (Alcock.)

Arabian Seas, India.

Genus HYPNOS Duméril

Hypnos Duméril, Rev. Mag. Zool., ser. 2, vol. 4, p. 277, 1852. (Type, *Hypnos subnigrum* Duméril, monotypic.)

Hypnarce Waite, Rec. Austral. Mus., vol. 4, p. 180, 1902. (Type, *Hypnos subnigrum* Duméril, virtually. *Hypnarce* Waite proposed to replace *Hypnos* Duméril, supposed preoccupied by *Hypna* Hübner in Lepidoptera.)

Hypnarea Sharp, Zool. Record, vol. 39, 1902, index, p. 9, 1903. (Type, *Hypnos subnigrum* Duméril.)

Disk broader than long. Tail short. Eyes small. Mouth moderate, not protractile, preoral region short. Teeth small, numerous, tricuspid, in rather wide bands. Gill openings small. Spiracle large, close behind eyes, fringed. Large electric organ between head and each pectoral. Dorsals two, small, above ventrals. Caudal small. Ventrals large, united. Vent far behind middle of total length.

HYPNOS SUBNIGRUM Duméril

Hypnos subnigrum Duméril, Rev. Mag. Zool., ser. 2, vol. 4, p. 279, pl. 12, 1852 (type locality: Sydney, New South Wales); Hist. Nat. Elasmobr., vol. 1, p. 520, 1865 (types).—Günther, Cat. Fishes British Mus., vol. 8, p. 453, 1870 (West Australia).—Macleay, Proc. Linn. Soc. New South Wales, vol. 5, p. 310, 1880 (Port Jackson; West Australia); vol. 6, p. 374, 1881 (Port Jackson; West Australia).—Woods, Fish. Fisher. New South Wales, p. 100, 1882.—Macleay, Proc. Linn. Soc. New South Wales, vol. 7, p. 12, 1883 (Port Jackson).—Haswell, Proc. Linn. Soc. New South Wales, vol. 9, p. 104, pl. 11, figs. 6–9 (skeleton), 1884.—Ogilby, Cat. Fish. New South Wales, p. 5, 1886; Cat. Fishes Australian Mus., pt. 1, p. 16, 1888 (Clarence River, Port Jackson).—Howes, Proc. Zool. Soc. London, 1890, p. 669, pl. 57 (visceral anatomy).—Waite, Mem. Australian Mus., vol. 4, p. 42, 1899 (New South Wales); Mem. New South Wales Nat. Club, No. 2, p. 10, 1904.—Zietz, Trans. Roy. Soc. South Australia, vol. 32, p. 292, 1908.—Stead, Fishes of Australia, p. 233, 1908 (New South Wales).—McCulloch, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, pl. 38, figs. 3–4, 1921.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 499, 1930 (reference).

Hypnos subniger Ogilby, Mem. Queensland Mus., vol. 5, p. 83, 1916 (Moreton Bay and South Hill).

Hypnarce subnigrum Waite, Mem. Australian Mus., vol. 4, p. 42, 1899 (off Newcastle Bight and Shoalhaven Bight, 11–48 fathoms).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 304, 1913 (Sydney and West Australia).—McCulloch, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 467, 1921 (New South Wales; Great Australian Bight; Port Jackson and Clarence River estuary; Rottnest Island, West Australia).—Waite, Rec. South Australian Mus., vol. 2, No. 1, p. 28, fig. 41, 1921.—McCulloch, Fishes New South Wales, ed. 2, p. 10, pl. 3, fig. 33a, 1927.

Hypnarce subnigra Waite, Rec. Australian Mus., vol. 4, p. 180, 1902 (Rottnest Island, West Australia).—McCulloch, Proc. Linn. Soc. New South Wales, vol. 46, p. 457, 1921.—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).

Depth 7¼ to 11⅖ to end of tail; head 3¾ to 4⅛, disk width 1⅔ to 1¾ its length. Snout 2 to 2⅖ in head; eye very small, 4⅔ to 5 in interorbital; mouth width 2⅕ to 2⅗ in head; teeth in 40 to 50 rows in jaws, bicuspid, cusps long, slender points; internarial 2 to 2¾ in mouth width; front nasal flap small, broad, with short adnate tentacle; interorbital 3⅛ to 4 in head, nearly level, supraorbital edges little elevated. Gill openings rather large, equidistant, subequal. Spiracles large, deep, twice eye, edge fringed all around.

Skin smooth.

Dorsal 2¼ to 3 in head; second dorsal 2¼ to 2⅔; caudal 2⅞ to 3⅔, rounded; pectoral convex, not very broad, forms deeply ovate disk; ventrals equal head, obtusely rounded; claspers about equal mouth width, depressed, robust, with deep curved groove terminally.

Brown above, clouded little with darker and edges of disk paler all around. Below uniform whitish.

Queensland, New South Wales, South Australia, West Australia. One from Moreton Bay seen in the Queensland Museum.

Waite says, "I unwittingly placed my hand on one as it lay on deck partly concealed by overlying fishes. As was afterwards found, it was the largest example obtained, and measured 690 mm. (2 feet 3 inches) in length. The shock I so unexpectedly received was very intense and it is quite conceivable that one from such a fish, not previously harassed, would be sufficient to disable a man."

U.S.N.M. No. 28667. Port Jackson. Australian Museum. Length, 380 mm.
U.S.N.M. No. 39994. Port Jackson. Australian Museum. Length, 325 mm.
U.S.N.M. No. 39997. Port Jackson. Australian Museum. Length, 340 mm.
U.S.N.M. No. 84374. Great Australian Bight. *Endeavour* collection. Length, 330 mm.

Genus TORPEDO Houttuyn

Torpedo HOUTTUYN, Nat. Hist. Linn., p. 453, 1764 (Atypic: Type, *Raja torpedo* Linnaeus, assumed by tautonymy).—DUMÉRIL, Zool. Analytique, p. 343, 1806 (Atypic: Type, *Raja torpedo* Linnaeus).

Narcacion KLEIN, Neuer Schauplatz, pt. 2, p. 237, 1776; pt. 4, p. 726, 1777. (Species nonbinomial. Type, *Raja torpedo* Linnaeus, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 39, 1917.)

Narcobatus BLAINVILLE, Bull. Soc. Philomath. Paris, vol. 8, p. 121, 1816. (Type, *Raja torpedo* Linnaeus, designated by Jordan and Evermann, Genera of fishes, pt. 1, p. 95, 1917.)

Narcobatis BLAINVILLE, Faune Française, Poissons, p. 43, 1825. (Type, *Raja torpedo* Linnaeus, monotypic.)

Tetronarce GILL, Ann. Lyceum Nat. Hist. New York, vol. 7, p. 387, 1862. (Type, *Torpedo occidentalis* Storer, monotypic.)

Tetranarce JORDAN, Genera of Fishes, pt. 3, p. 307, 1919. (Type, *Torpedo occidentalis* Storer. Emendation.)

Gymnotorpedo FRITSCH, Arch. Anat. Phys. Leipsig, p. 365, 1886. (Type, *Torpedo occidentalis* Storer.)

Fimbriotorpedo FRITSCH, Arch. Anat. Phys. Leipzig, p. 365, 1886. (Type, *Torpedo marmorata* Risso.)

Tetronarcine TANAKA, Journ. Coll. Sci. Tokyo, vol. 23, p. 2, 1908. (Type, *Tetronarcine tokionis* Tanaka, monotypic.)

Eunarce Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 472. (Type, *Torpedo narke* Risso, orthotypic.)

Notastrape Whitley, Rec. Austral. Mus., vol. 18, p. 327, 1932. (Type, *Notastrape macneilli* Whitley, orthotypic.)

Disk wider than long, subcircular. Tail distinct, short, with low keel each side. Snout short, weak, flexible. Rostral cartilage weak, short, reduced to pair of slender rods. Mouth crescentic, with longitudinal fold at each angle. Teeth small, in pavement, bases broad, crown with an acute angle directed inward. Spiracles moderate, close behind eyes, with or without fringed edges. Two dorsals. Caudal well developed. Ventrals not united, anteriorly below pectorals.

Tropical and temperate seas. The species are evidently quite variable and the slight structural differences, such as the position of the dorsal fins are apparently unreliable.

ANALYSIS OF SPECIES

a^1. Torpedo. Spiracles fringed, at least in young.
  b^1. Body marbled or spotted finely with darker------------------ marmorata
  b^2. Body marked with variable or irregular large and small dark spots. sinus persici
a^2. Tetronarce. Spiracles entire, not fringed.
  c^1. Base of first dorsal and ventral bases ending even---------- fairchildi
  c^2. Base of first dorsal half above ventral bases-------------- nobiliana
  c^3. Base of first dorsal with less than half its base over ventrals-- tokionis

Subgenus TORPEDO Houttuyn

TORPEDO MARMORATA Risso

Torpedo marmorata Risso, Ichth. Nice, p. 20, pl. 111, fig. 4, 1810 (type locality: Nice).—Guichenot, Mém. Soc. Sci. Nat. Cherbourg, vol. 12, p. 20, 1866 (Madagascar).—Günther, Cat. Fish. Brit. Mus., vol. 8, p. 450, 1870 (Port Natal).—Boulenger, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 2, 1891 (Madagascar).—Regan, Ann. Natal Gov. Mus., 1908, p. 242 (Bird Island, Congella, Algoa Bay).—Annandale, Mem. Indian Mus., vol. 2, p. 42, pl. 3a, fig. 4 (teeth), pl. 5, fig. 3, 1909 (Puri and Quilon).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, pt. 6, p. 8, 1913 (Mekran).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, pt. 3, p. 286, 1916 (reference).

Narcacion marmoratus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 305, pl. 61, figs. 1–3 (embryos), pl. 67, fig. 1–2, 1913.

Narcobatus marmoratus Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 90, pl. 5, fig. 4, 1925.

Raja torpedo (part) Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 231, 1758.

Narcobatus torpedo Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 472 (Bonaparte material).

Raja maculata Shaw, General zoology, vol. 5, p. 316, 1804 [on *Temeree* Russell, Fishes of Coromandel, vol. 1, p. 1, pl. 1, 1803 (type locality: Vizagapatam)].

Raja bicolor Shaw, General zoology, vol. 5, p. 316, 1804 [on *Nalla temeree* Russell, Fishes of Coromandel, vol. 1, p. 2, pl. 2, 1803 (type locality: Vizagapatam)].

Torpedo galvani Risso, Ichth. Nice, p. 21, pl. 111, fig. 5, 1810 (type locality: Nice) (on Rondelet).—Bonaparte, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 3–5, 1833 (Italy); Cat. Metod. Pesci Europei, p. 14, 1846 (Mediterranean and Atlantic).

? *Torpedo ocellata* Quoy and Gaimard, Voy. *Uranie*, Zool., p. 199, 1824 (type locality: Table Bay at Cape of Good Hope).

Torpedo panthera Olfers, Torpedo, p. 15, 1831 ("Mus. Berol."; diagnosis).

Torpedo mamorata var. *panthera* Olfers, Torpedo, p. 16, 1831 (type locality: Red Sea).

Torpedo panthera (Ehrenberg) Rüppell, Neue Wirbelth., Fische, p. 68, pl. 19, fig. 1, 1835 (Tor, Red Sea).—Müller and Henle, Syst. Beschr. Plagiostomen, p. 193, 1841 (Red Sea).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 510, 1865 (compiled).—Günther, Cat. Fishes British Mus., vol. 8, p. 451, 1870 (copied).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 678, 1871 (Koseir, Red Sea).—Bamber, Journ. Linn. Soc. London, vol. 31, Zool., p. 38, 1915 (Sudanese Red Sea).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 193 (Tegula River mouth in 60 fathoms); vol. 87, p. 364, 1935 (Durban).

Narcacion panthera Garman, Mem. Mus. Comp. Zool., vol. 36, p. 307, 1913 (Red Sea).

Torpedo diversicolor Davy, Philos. Trans. Roy. Soc. London, vol. 2, p. 542, pls. 22–24 (anatomy), 1834 (type locality: Malta).

Torpedo vulgaris Fleming, British animals, p. 169, 1842 (type locality: Irish coast; English coast).

Torpedo picta Lowe, Proc. Zool. Soc. London, 1843, p. 93 (type locality: Madeira).

Torpedo trepidans Valenciennes, Hist. Nat. Canaries, vol. 2, pt. 2, p. 101, 1835–1850 (type locality: Canaries).

Torpedo hebetans Valenciennes, Hist. Nat. Canaries, vol. 2, pt. 2, pl. 23, fig. 2, 1835–1850.

Torpedo fuscomaculata Peters, Arch. Naturg., p. 278, 1855 (type locality: Mozambique, Anyoxe, Ibo).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 510, 1865 (copied).—Günther, Cat. Fishes Brit. Mus., vol. 8, p. 451, 1870 (Zanzibar).—Peters, Monatsb. Akad. Wiss. Berlin, p. 447, 1876 (Mauritius; Seychelles).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891.

Narcacion fuscomaculata Garman, Mem. Mus. Comp. Zool., vol. 36, p. 308, 1913 (Mauritius).

Narcobatus polleni Bleeker, Nederland. Tijdschr. Dierk., vol. 3, p. 171, 1866 (type locality: Réunion); Faune Madagascar, 1874, p. 1, pl. 1.—Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891.

Torpedo suessii Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 107, pt. 1, p. 784, pl. 2, 1898 (type locality: Perim; Mocca, Red Sea).

Narcacion suessi Garman, Mem. Mus. Comp. Zool., vol. 36, p. 308, 1913 (copied).

Torpedo zugmayeri Englehardt, Zool. Anz., vol. 39, p. 647, 1912 (type locality: Gwadar, Beluchistan).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8 (Mekran), p. 17, 1913 (copies Englehardt).

Snout short, greater than interorbital, nearly horizontal or straight across front profile as seen from above; eye less than spiracle, 2 in level interorbital; mouth small, width slightly over half preoral length, longitudinal fold each side; teeth in 18 rows, small, bases wide; internasal equals mouth width. Spiracle eye diameter behind eye, with 8 or 9 fleshy marginal tentacles behind.

Skin smooth.

Dorsals small, inner angles obtuse, origin of first above ventral end, base end slightly behind ventral base; second dorsal origin slightly behind depressed ventral ends; tail 3⅕ in total, small, weak, low fold each side, hind caudal edge convex; pectorals form subcircular disk, length 1⅕ its width.

Nearly burnt umber above, everywhere with small, irregular, light or pale broken vermiculating lines, some circles, others dots, hooks, bars or blotches and smaller, more numerous, and crowded along disk edges, especially forward. Below whitish, disk edges, ventrals, and tail below mottled with dull umber and whitish.

Red Sea, Arabia, Zanzibar, Mozambique, Natal, Cape of Good Hope ?, Madagascar, Mauritius, Seychelles, Beluchistan, India. Also in the Atlantic.

Torpedo zugmayeri is evidently a synonym, having been separated only on minor differences. It is noticed as follows:

Snout tip to vent 190 mm.; distance between outer eye edges equals that of eye from body edge. Spiracle each with very short fringe, width in space between spiracles 1⅔ and equals space from hind spiracle edge to eyes. Second dorsal ¾ of first dorsal; caudal with robust lateral keels; disk width equals distance from mouth to ends of ventrals; vent to tail tip 140 mm.

Above clear brown, marbled with blackish, below yellowish white with brownish blotched edges. Length, 330 mm.

4322. D. 5220. San Andreas Island (W.), S. 57° W., 8.50 miles (13° 38′ N., 121° 58′ E.). April 24, 1908. In 50 fathoms. Edges of spiracle entire. Length, 105 mm. Back warm brownish. Many large, darker brown blotches, several large as combined eye and spiracle, others variously small though most close set on middle of back and tail. Dorsals and caudal brownish. Under surface whitish, pectoral margins broadly posteriorly and most of lower surfaces of ventrals dull umber brown.

1 example, A.N.S.P. Tugela River mouth, in 60 fathoms, Natal. H. W. Bell Marley. Length, 210 mm.

TORPEDO SINUS PERSICI Olfers

Torpedo sinus persici Olfers, Torpedo, pp. 15, 17, 1831 (on Kämpfer).—Henle, Uber Narcine, p. 31, 1834.—Duméril, Rev. Mag. Zool., ser. 2, vol. 4, p. 239, 1852 (Red Sea); Hist. Nat. Elasmobr., vol. 1, p. 509, 1865 (Red Sea) —Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 677, 1871 (Koseir, Red Sea).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 3, pl. 1, 1891 (Madagascar).—Bamber, Journ. Linn. Soc. London, vol. 31, Zool., p. 38, 1915 (Sudanese Red Sea).—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 30, No. 4, p. 2, 1926 (Bombay); vol. 33, No. 1, p. 101, 1928 (Bombay).

Narcacion sinus persici Garman, Mem. Mus. Comp. Zool., vol. 36, p. 309, 1913 (South Africa ?, Persian Gulf).

Raja torpedo (not Linnaeus) Gmelin, Syst. Nat. Linn., vol. 1, p. 1504, 1789 (on Kämpfer).

Torpedo smithii Günther, Cat. Fishes British Mus., vol. 8, p. 451, 1870 (type locality: South Africa).

Snout short, much greater than interorbital, nearly straight across front profile as seen from above; eye less than spiracle, 2 in level of interorbital; mouth small, width 1⅗ to 1⅔ to front profile; teeth small, in about 20 rows in each jaw; internasal 1 to 1⅕ mouth width. Spiracle eye diameter behind eye, with 8 or 9 fleshy marginal tentacles behind.

Skin smooth.

Dorsals small, inner angles rounded; origin of first before hind basal edge of ventral and base end well behind ventral base; tail 2⅓ in total length, with small low fold each side; hind caudal edge convex; pectorals form subcircular disk, length $1\frac{1}{10}$ its width.

Nearly fawn color above, with large dusky to dusky black blotches, not sharply defined, close set, more or less uniform and all nearly twice larger than eyes and spiracles. None extend on dorsals or caudal or have faded ? from caudal peduncle and also not very distinct on ventrals. Lower surface whitish, with light brown around edges of disk.

Red Sea, Persian Gulf, South Africa ?, Madagascar, India.

1 example. A.N.S.P. Bombay. Bombay Natural History Society. 1925. Length, 140 mm.

Subgenus TETRONARCE Gill

TORPEDO FAIRCHILDI Hutton

Torpedo fairchildi HUTTON, Colonial Mus. Geol. Survey Dept. (Fishes of New Zealand), p. 83, pl. 12, fig. 134 (outline), 1872 (type locality: Napier Harbor, New Zealand).—HOBSON, New Zealand Journ. Sci., vol. 2, pp. 27, 123, 1886 (breeding).—MCCULLOCH, Rec. Australian Mus., vol. 12, p. 171, pl. 25, 1919 (New South Wales).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 499, 1930 (reference).

Narcacion fairchildi WAITE, Rec. Canterbury Mus., vol. 1, No. 1, p. 8, 1907 (reference); vol. 1, No. 2, p. 144, pl. 17, 1909 (Otago Heads, Banks Peninsula, Cook Strait, Poverty Bay, Bay of Plenty, Hauraki Gulf, in 18–102 fathoms).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 310, 1913 (Napier Harbor; Australia).

Narcobatus fairchildi WAITE, Rec. South Australian Mus., vol. 2, p. 28, fig. 40, 1921.—MCCULLOCH, Biol. Res. *Endeavour*, vol. 5, pt. 4, p. 159, 1926 (Bass Strait, Great Australian Bight, in 80–320 fathoms); Fishes of New South Wales, ed. 2, p. 10, pl. 3, fig. 32a, 1927.

Torpedo fusca PARKER, Trans New Zealand Inst., vol. 16, p. 283, pl. 22, 1884 (type locality: Dunedin, New Zealand).—KILCOYNE, Trans. New Zealand Inst., vol. 27, p. 672, 1895.

Notastrape macneilli WHITLEY, Records Austral. Mus., vol. 18, p. 327, 1932 (type locality: Off Green Cape, New South Wales, 49 fathoms, as *Torpedo fairchildi* McCulloch, not Hutton).

Head to hind spiracle edge 7⅖ in total length. Snout 1⅔ in head to hind spiracle edge; eye 7, 4¼ in snout, 3¾ in interorbital; mouth arched, wide as its distance from end of snout; teeth in band in jaws, with broad bases and sharp upstanding points; each nostril with free erect lobe posteriorly, second pointed one overhangs upper lip; internasal valve subquadrangular, angles rounded, hind edge with median incision with small fleshy tubercle; internasal equals half preoral length; interorbital 1$\frac{3}{10}$ in head to hind spiracle edge. Spiracle subovate, oblique, edges entire, interspiracle width 2½ in head to hind spiracle edge.

Skin smooth. Lateral line well defined each side of back.

First dorsal with middle of base over hind basal ventral edge, fin length 1⅓ in head to hind spiracle edge; second dorsal 2; caudal 4⅓ in rest of body; pectorals form subcircular disk, length 1⅕ its width, tail 1⅕ in disk length; ventral 5 in total length, obtuse.

Chocolate-brown above, white below. Width, 470 mm. (McCulloch.)

South Australia, Victoria, New South Wales, New Zealand. Reaches 716 mm. according to McCulloch. Of *Notastrape macneilli* Whitley says: "The Australian species . . . is chocolate brown in colour above and white below, whereas the New Zealand type is uniform greyish-black above and has a more prominent snout, and disk much broader anteriorly."

TORPEDO NOBILIANA Bonaparte

Torpedo nobiliana Bonaparte, Icon. Fauna Ital. Pesci, vol. 3, pt. 2, fasc. 12 (descr., pl.), 1835 (type locality: Italy); Cat. Metod. Pesci Europei, p. 14, 1846 (Mediterranean).

Tetronarce nobiliana Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1901, p. 336 (types).

Narcobatus nobiliana Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 472 (types).

Narcobatus nobilianus Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 89, 1925 (compiled).

Narcacion nobilianus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 310, pl. 25, fig. pl. 61, figs. 4–5, 1913 (young).—Norman, *Discovery* Rep., vol. 12, p. 37, 1935 (South Africa).

Torpedo hebetans Lowe, Trans. Zool. Soc. London, vol. 2, p. 195, 1841 (type locality: Madeira).—Von Bonde and Swart, Marine Biol. Surv. South Africa Rep., pt. 3, 1922, p. 15, 1924 (reference).

Torpedo occidentalis Storer, Amer. Journ. Sci. Arts, vol. 45, p. 166, pl. 3, 1843 (type locality: Wellfleet, Mass.).

Torpedo nigra Guichenot, Explor. Algérie, Poiss., p. 131, pl. 8, 1850 (type locality: Algeria).

Depth 10 to 10¼ to subcaudal origin; head to first gill opening 4¼ to 4⅓. Snout end to eye 2 to 2⅗ in head; eye 6 to 7½, 3 to 3¾ in snout, 3 to 3¼ in interorbital; mouth width 2¼ to 2⅖ in head, slight groove at each angle; teeth in 22 to 50 rows above, 20 to 45 below, cusps short, conic, acute, erect; internarial 3⅓ to 3½ in head; interorbital 2½ to 2⅘, nearly level. Spiracle long as eye, interspace slightly greater than interorbital, margins entire. Median gill openings largest, about 1⅗ times eye.

Skin everywhere smooth.

First dorsal with about first fourth its base over hind base of ventral, length 1¾ to 1⅘ in head; second dorsal 2½ to 2¾; caudal 1, hind edge obliquely rounded; pectorals form orbicular disk, length 1⅕ to 1¼ in its width, broadly rounded; tail 1 to 1⅛ in disk length; ventral length 4 to 4¾.

Above cinnamon, mostly uniform. Eyes gray. Fins like back. Under surface of body pale brownish to creamy white, sometimes outer edges of pectorals and ventrals narrowly cinnamon.

Though native in the Eastern Atlantic and Mediterranean, also reported from South Africa.

A.N.S.P. Nos. 426–439, 461–469. Italy. C. L. Bonaparte No. 234. Dr. T. B. Wilson. Length, 193 to 250 mm. Cotypes of *Torpedo nobiliana*. Also jaws 220 mm. wide of large example. 17 are males.

TORPEDO TOKIONIS (Tanaka)

Tetronarcine tokionis TANAKA, Journ. College. Sci. Tokyo, vol. 23, p. 2, text fig. (outline), 1908 (type locality: Sagami Bay).

Narcacion tokionis GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 312, 1913 (copied).

Torpedo tokionis FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

Head to hind spiracle edge 8¾ in total. Snout 1¾ in head to hind spiracle edge; eye small, orbit 3⅕ in head, 2 in snout, 1½ in interorbital; mouth small, width slightly greater than its distance from snout tip; teeth in jaws in several rows, each tooth with sharp point; front nasal valves confluent into quadrangular lobe; interorbital 2 in head to hind spiracle edge. Spiracles oblong, less their longitudinal diameter or less twice eye length behind eye, edge entire, not fringed.

Skin smooth.

First dorsal origin before hind ventral end, less than half dorsal base opposite ventral, fin length equals head to hind spiracle edge; second dorsal 1⅓; caudal 5⅕ in rest of body, hind edge emarginate; pectorals form rounded disk, length slightly greater than tail, or 1⅙ in its own width; ventrals separate, obtuse.

Brown above, uniform. Below whitish, narrowly brown along margins. Length, 1136 mm. (Tanaka.)

Japan.

Genus NARKE Kaup

Narke KAUP, Isis, vol. 18, p. 88, 1826. (Type, *Raja capensis* Gmelin, monotypic.)

Astrape MÜLLER and HENLE, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 117. (Atypic; Arch. Naturg., 1837, p. 400. Type, *Raja capensis* Gmelin, designated by Jordan, Genera of Fishes, vol. 2, p. 193, 1919.)

Bengalichthys ANNANDALE, Mem. Indian Mus., vol. 2, p. 46, 1909. (Type, *Bengalichthys impennis* Annandale, monotypic.)

Body, head, electric organs, and pectorals joined as subcircular disk. Tail short, with fold each side. Eyes small, protruding. Mouth small, protractile, surrounded by fold. Teeth small, in narrow bands. Front nasal valves confluent in quadrangular flap, free behind, covering mouth. Gill openings narrow. Spiracles larger than eyes, close behind orbits, with smooth raised edges. Skin smooth, soft, naked. One dorsal. Caudal moderate, supracaudal longer. Ventrals broad, distinct, inserted below pectorals.

Concerning *Bengalichthys*, Annandale has the following interesting remarks: "In several respects the adaptation is of a nature closely similar to that which has brought about the evolution of *Benthobatis* from *Narcine*, although the environment in which this evolution has taken place is not the same in the two cases. *Benthobatis*, as I have already pointed out, is a deep-sea form—it occurs at depths from about 400 to about 700 fathoms—and, like many deep-sea forms, has degenerate eyes. The disk, moreover, is thick and muscular and bears on the dorsal surface numerous little glandular pits; the pectoral fins are not clearly marked off from the body. In all these points the species of *Bengalichthys* to be described immediately resembles *Benthobatis*, although it is not a deep-sea form, having been taken in only 15 fathoms. In two striking characters, however, it differs from *Benthobatis*, viz, in coloration and in the number of the dorsal fins. The former difference is probably owing to its environment, the latter to its ancestry; in other words, the former is an adaptive character, the latter a morphological one. A character common among deep-sea fish of all kinds is a dark and uniform coloration of both the dorsal and the ventral surface, while among the rays of shallow water it is unusual for the ventral surface to be dark, although this is the case in a few species. The only [then] known species of *Benthobatis* has a dark ventral surface, the only known species of *Bengalichthys* a pale ventral surface. The genera of the Torpedinidae, on the other hand, fall naturally into several groups separated by the number (or absence) of their dorsal fins. *Benthobatis* belongs to one of these groups, *Bengalichthys* to another. There can be little doubt, therefore, that the two genera have not had the same ancestry but have become like each other owing to parallel, or rather convergent, lines of evolution. Although *Bengalichthys* does not live in the dark abysses of the sea, we may suppose that its mode of life is very similar to that of *Benthobatis*. Neither can be a powerful swimmer, but both, judging from the manner in which the muscles of the disk are developed, must be powerful wrigglers and squirmers. It must be remembered in this connection that the flabbiness of the flesh (i. e., the muscles) of deep-sea fish which have been brought to the surface is mainly an artificial condition, not one that would be apparent if it were possible to examine the fish in their natural environment. Now, quite apart from the question of the depth at which a fish lives, it is clear that eyes may be inconvenient to an animal which wriggles about in the mud at the bottom of the sea, and I have little doubt that both the fish under discussion live in this way, perhaps actually burrowing into the mud, through which the movements of their disks assist them to make their way. Their mouths, like those of their nearest allies in both cases, are feebly developed and probably suctorial in function. Neither they nor their allies can attack large organisms of any kind, and it is clear that their electric organs must be weapons of defense rather than offense. Perhaps both *Benthobatis* and *Bengalichthys* have become more perfectly adapted for obtaining their food by sucking it from the mud, owing to the degeneracy of certain organs that are of no use for this particular purpose."

ANALYSIS OF SPECIES

a^1. NARKE. Eyes small, though distinct and pigmented.
  b^1. Dorsal base above ventrals; vent postmedian; variably uniform dark brown above, below white ---------- capensis
  b^2. Dorsal base behind ventrals; vent median.
    c^1. Ventrals with outer angle, edge concave; brown above, with white spots and edges, white below ---------- dipterygia
    c^2. Ventrals without outer angle, edge convex; brown above and below, plain or spotted with black and white ---------- japonica
a^2. BENGALICHTHYS. Eyes minute, sunken, colorless; above deep buff, clouded with dark brown and few pale spots or streaks and edge creamy, below creamy ---------- impennis

Subgenus NARKE Kaup

NARKE CAPENSIS (Gmelin)

Raja capensis GMELIN, Syst. Nat. Linn., vol. 1, p. 1512, 1789 (type locality: Cape of Good Hope).—WALBAUM, Artedi Pisc., vol. 3, p. 536, 1792 (on Gronow).—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 158, 1798 (copied).—SCHNEIDER, Syst. Ichth. Bloch, p. 360, 1801 (Cape of Good Hope).

Torpedo capensis OLFERS, Torpedo, p. 23, pl. 2, fig. 1, 1831 (Cape of Good Hope).—GRAY, Cat. fish Gronow, p. 13, 1854 (Cape of Good Hope).

Narcine capensis HENLE, Über Narcine, p. 36, pl. 3, fig. 1, 1834.

Astrape capensis MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 130, 1841 (Cape of Good Hope).—GRAY, List fish British Museum, p. 108, 1851 (reference).—DUMÉRIL, Rev. Zool., p. 280, 1852 (reference).—BLEEKER, Nat. Tijds. Nederland. Indië, vol. 21, p. 58, 1860 (Cape of Good Hope).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 522, 1865 (Cape of Good Hope).—KNER, Reise *Novara*, Fische, p. 419, 1865 (Cape of Good Hope).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 454, 1870 (Cape of Good Hope; Madagascar).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.—REGAN, Ann. Natal Gov. Mus., vol. 1, p. 242, 1908 (Bird Island).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 3, p. 287, 1916 (references).

Narke capensis Garman, Mem. Mus. Comp. Zool., vol. 36, p. 313, 1913 (Cape of Good Hope; Madagascar).—Thompson, Marine Biol. Rep. South Africa, no. 2, p. 161, 1914.—VonBonde and Swart, Marine Biol. Surv. South Africa Rep., pt. 3, 1922, p. 15, 1924 (compiled).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 92, pl. 5, fig. 3, 1925.

Head to spiracle $7\frac{2}{5}$ total length. Snout $1\frac{1}{6}$ in head to spiracle; eye $5\frac{1}{2}$, 3 in interorbital, which $1\frac{4}{5}$ in head to spiracle. Spiracle close behind eye, little larger.

Dorsal origin close behind hind basal ventral edge, fin length $1\frac{1}{8}$ in head to spiracle; caudal 4 in rest of body; pectorals form somewhat broadly elliptical disk, length little greater than rest of body, width about $1\frac{1}{10}$ its length; ventral about $4\frac{1}{5}$ in total, obtuse; vent nearer end of tail than front edge of body.

Above variably uniform dark brown above. Lower surfaces whitish. Reaches 280 mm. (Barnard.)

South Africa, Natal, Madagascar. According to Garman invariably spotted white above and brown below.

NARKE DIPTERYGIA (Schneider)

Rhinobatus dipterygia Schneider, Syst. Ichth. Bloch, p. 359, 1801 (type locality: Tranquebar).

Narcobatus dipterygius Blainville, Bull. Soc. Philomath., Paris, vol. 8, 1816, p. 121 (name only).

Torpedo dipterygia Olfers, Torpedo, p. 25, pl. 2, fig. 2, 1831.

Narcine dipterygia Henle, Über Narcine, p. 38, 1834.

Astrape dipterygia Müller and Henle, Syst. Beschr. Plagiostomen, p. 131, 1841 (Tranquebar).—Cantor, Jour. Asiatic Soc. Bengal, vol. 18, p. 1401, 1849 (Pinang, Malay Peninsula, Lancavy Islands, Singapore).—Gray, List fish British Museum, p. 103, 1851 (reference).—Jerdon, Madras Journ. Lit. Sci., vol. 17, p. 149, 1851.—Duméril, Rev. Zool. ser. 2, vol. 4, p. 281, 1852 (reference).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 50, 1852 (Singapore, Pinang); (Bengal), vol. 25, p. 82, 1853 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 523, 1865 (Malacca).—Day, Fishes of Malabar, p. 523, 1865 (Malacca).—Günther, Cat. Fishes British Mus., vol. 8, p. 454, 1870 (Pinang, Canton).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Yokohama).—Day, Fishes of India, pt. 4, p. 734, pl. 192, fig. 4, 1878 (Madras); Fauna British India, Fishes, vol. 1, p. 46, fig. 19, 1889.—Bartlett, Sarawak Gazette, vol. 26, no. 366, p. 134, 1896 (Oya and Moratabas).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 60, 1897.—Annandale, Mem. Indian Mus., vol. 2, p. 46, pl. 3a, fig. 6, 1909 (off Orissa and Bengal Bay).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).—Tirant, Service Océanogr. Pêches Indo-Chine, 6e note, p. 75, 1929 (Cochinchina).—Suvatti, Index Fish. Siam, p. 4, 1937 (Pattani).

Astrappe dipterygia Pearson, Ceylon Administr. Rep., 1914, p. E4 (error).

Narke dipterygia Garman, Mem. Mus. Comp. Zool., vol. 36, p. 313, 1913 (Pinang, Tranquebar, Malay Peninsula, Lancavy Islands, Malacca, Hindostan, Canton).—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 32, p. 253, 1927 (Bombay); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (Indian

Ocean); Hong Kong Nat., vol. 1, p. 138, fig. 19, 1930 (compiled).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 107, fig. 8, 1933 (Chusan).—FOWLER, List Fish, Malaya, p. 15, 1938 (reference).

Narce dipterygia CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1e Note, p. 6, 1926 (Gulf of Siam).

Snout short, greater than interorbital, slightly convex across front profile as seen from above; eyes small, about half length of spiracle, 3½ in interorbital; mouth width equals space to front profile, small, protractile; teeth in 15 rows in each jaw, low broad cusps; internasal slightly less than mouth width; interorbital depressed. Spiracles continuous with eyes, greatly larger, ovate, edges entire.

Skin smooth.

Dorsal inserted behind ventral tips, little nearer upper caudal lobe origin than ventral origin; pectorals form subcircular disk, wide as long, length little less than tail; ventral with deeply incised outer margin, front rays forming anterior lobe.

Brown above, with several diffuse blackish cloudings medially. Dorsal and caudal brown, also upper surface of ventral. Under surface of body and ventrals below white.

Arabian Sea, India, Malay Peninsula, Pinang, Singapore, East Indies, Indo China, China, Japan.

1 example A. N. S. P. Bombay. 1925. Prof. F. Hallberg. Length, 135 mm.

NARKE JAPONICA (Schlegel)

Torpedo (*Astrape*) *japonica* SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 307, pl. 140, 1850 (type locality: Japan).

Astrape japonica BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22. 1853 (Japan).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 60, 1897.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 740, 1900 (Yokohama); Annot. Zool. Japon., vol. 3, p. 41, 1901 (Nagasaki).—JORDAN and FOWLER, Proc. U. S. Nat Mus., vol 26, p. 656, 1903 (Wakanoura).—PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 640, 1908 (Japan).

Narke japonica SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Misaki; Kagoshima).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 314, pl. 24, fig. 3, pl. 56, fig. 10, pl. 67, figs. 3–4, 1913 (Sagami Sea).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 187, 1920 (Misaki).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 12, fig. 9, 1929 (Amoy).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (Japan).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 11, 1931 (Tokyo).—TANAKA, Jap. Fish. Life Colours, No. 33, 1933.

Ceratoptera ehrenbergii (not Müller and Henle) DAY, Fishes of India, Suppl., p. 812, 1888 (note on woodcut).

Astrape dipterygia (not Schneider) ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 60, 1897.

Depth 8 to 11¼ to end of tail; head 5 to 7½; disk width 1⅕ to 2 in its length to hind pectoral edge. Snout 1⅓ to 1⅞ in head, front edge broadly and but slightly convex as viewed from above; eye

7 to 7½, 4 to 5 in snout, 3 to 3¼ in interorbital; dentary width 3¼ to 4 in head; teeth in 13 or 14 rows in jaws, small, rhomboid, flattened; nostrils rather large, nasoral continuous with mouth, internarial greater than mouth width or 3 to 4 in head; interorbital 2 to 2⅔, level. Gill openings small, nearly equidistant. Spiracle small, close behind eye, subequal with eye.

Skin smooth; soft.

Dorsal length 1¼ to 1⅗ in head, rounded lobe; caudal 3½ to 4 in rest of body length, lobes subequal; least depth of caudal peduncle 4 to 5¼ in head; pectoral moderate, outer edge broadly convex; ventral 4⅖ to 5 in total length.

Burnt umber above, below paler, everywhere uniformly colored.

Japan.

U.S.N.M. No. 57520 Japan. P. L. Jouy. Length, 307 mm.
U.S.N.M. No. 71186. Misaki, Japan. *Albatross* expedition 1906. Length, 158 mm.
U.S.N.M. No. 71376. Kagoshima, Japan. *Albatross* expedition. Length, 103 mm.

Subgenus BENGALICHTHYS Annandale

NARKE IMPENNIS (Annandale)

Bengalichthys impennis ANNANDALE, Mem. Indian Mus., vol. 2, p. 48, text fig. 9, pl. 3a, figs. 7 (mouth), 7a (teeth), 1909 (type locality: Orissa coast).
Narke impennis GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 315, 1913 (Orissa).

Head to hind spiracle edge 8⅓ in total length. Snout 1⅖ in head to hind spiracle edge; eyes minute, deeply sunk, colorless, close to spiracles; teeth with triangular, transverse ridge, somewhat pointed; somewhat narrow, long rectangular process on mouth roof, directed backwards rather than vertically downwards, its terminal edge sinuous but not bilobed and similar smaller process on mouth floor; interorbital about 2⅓ in head to hind spiracle edge.

Dorsal small, halfway between hind basal ends of ventrals and caudal, length 1⅘ in head to hind spiracle edge; caudal 4⅘ in rest of body, rounded posteriorly (figure shows middle of hind edge with median notch); pectorals form ovate disk, widest anteriorly, length slightly less than tail, long as wide, each fin posteriorly with submarginal fringed ridge; ventrals distinct, about 6 in total along sides of tail.

Body above deep buff clouded with dark brown. Under surfaces, margins of disk and fins, large oval spot each side of back before root of tail, forwardly directed streak on each side of tail in front of dorsal fin and backwardly directed streak on base of disk at either side cream color. Length 175 mm. (Annandale.)

India.

Genus TYPHLONARKE Waite

Typhlonarke WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 16, 1909. (Type, *Astrape aysoni* A. Hamilton, monotypic.)

Disk subcircular, outline broken only by notch under tail. Tail short, with slight lateral fold each side. Eyes not distinct. Teeth in front part of jaws, pavementlike, hind series with sharp cusps. Spiracles with entire edges. Body naked. Dorsal fin single. Front part of ventrals modified for walking; hind part coalesced with pectorals to form hinder disk edge.

New Zealand. Differs from *Narke* in the absence of functional eyes, circular disk, short tail and the ventrals coalesced with the disk.

TYPHLONARKE AYSONI (A. Hamilton)

Astrape aysoni A. HAMILTON, Trans. New Zealand Inst., vol. 34, p. 225, pls. 10–12. 1902 (type locality: Foveaux Strait, New Zealand).

Typhlonarke aysoni WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 16, pl. 18, 1909 (New Zealand, Foveaux Strait, off Otago Heads, 36–102 fathoms).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

Head to hind spiracle edge 7⅓ in total length. Eye minute, white spot close before each spiracle; mouth narrow, protractile in fold of skin; lips extremely fleshy, upper divided in midline by an apparent space; lower lip very deep, sides of median fissure close together, each forming ridge where approximating; teeth form small pavementlike plate confined to front of each jaw; hind angle of each tooth produced slightly on anterior series, increasingly so backward until in hinder teeth sharp cusp developed; nostrils close together, covered by common subquadrangular valve; spiracles well developed, interspiracle space 2¾ to end of snout. Gill openings in subparallel series.

Dorsal origin little before hind disk edge, length ⅕ greater than base, latter equals interspiracle width between outer spiracle edges; caudal 4¾ in rest of body length, rounded; tail 2⅓; pectorals form circular disk, about long as wide; ventrals advanced, widely separated, directed almost at right angles or horizontally to body axis, front edges and rounded extremities covered with thick skin, attached posteriorly far within disk margin, horizontal length of each equals their distance apart; claspers small, not reaching hind disk edge.

Coffee-brown above, pale brown beneath, darker round disk margin. Mouth parts and ventral edges yellow. Length, 375 mm. (Waite.)

New Zealand, in depth to 102 fathoms.

Genus TEMERA Gray

Temera GRAY, Zool. Misc., p. 7, 1831. (Type, *Temera hardwickii* Gray, monotypic.)

Disk suborbicular, broader than long, longer than tail. Tail short. Eye small. Mouth small, protractile. Teeth in bands. Nasal valves short, confluent, reaching mouth. Spiracle smooth, moderate, close to eye. Electric organ between head and pectoral. No dorsal. Ventrals wide.

TEMERA HARDWICKII Gray

Temera hardwickii Gray, Zool. Misc. p. 7, 1831 (type locality: Pinang); Illustr. Indian Zool. Hardwicke, vol. 2, p. 2, pl. 102, figs. 1, a-b, 1832–34 (type).—Müller and Henle, Syst. Beschr. Plagiostomen, p. 131, pl. 60, fig. 2, 1841 (Pinang).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1402, pl. 12, figs. 1–2, 1849 (Pinang, Malay Peninsula, Singapore).—Duméril, Rev. Mag. Zool., ser. 2, vol. 4, p. 42, 1852 (reference).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 50, 1852 (Singapore, Pinang); (Bengal), vol. 25, p. 16 (on Gray), p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 20, p. 451, 1859–60 (Singapore).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 524, 1865 (compiled).—Günther, Cat. Fishes British Mus., vol. 8, p. 455, 1870 (types).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Singapore).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 316, 1913 (Pinang).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference); List Fish. Malaya, p. 15, 1938 (reference).

Temerara hardwickii Tirant, Service Océanogr. Pêches Indo-Chine, 6e Note, p. 75, 1929 (Cochinchina) (error).

Head to first gill opening $5\frac{1}{4}$ in total length. Snout $1\frac{4}{5}$ in head to first gill opening; orbit $7\frac{1}{2}$, $3\frac{3}{5}$ in snout, $3\frac{2}{3}$ in interorbital; mouth width $2\frac{2}{3}$ in head; internarial 3; interorbital 2. Spiracle around hind eye edge, little greater than eye. Gill openings subequal, small.

Caudal about $4\frac{2}{5}$ in rest of body, hind edge apparently uneven; pectorals form circular disk, length little greater than tail, $1\frac{1}{8}$ in width; ventral $3\frac{9}{10}$ in total body length, obtuse, without prominent front lobe; vent midway between mouth and tip of tail.

Disk and body above brown, below creamy white, edges of disk grayish. Eyes and spiracles each in dull yellowish blotch. Figure shows black line curving from right eye over to middle of left pectoral submarginally. Another black vertical line apparently intended as vertebral opposite ventrals. (Gray; Garman.)

Malay Peninsula, Pinang, Singapore, Cochinchina.

Family RAJIDAE

Body and head greatly depressed, united with pectorals to form rhomboid disk. Tail distinct, slender, depressed, with rather long fold along each side. Eyes superior. Mouth inferior. Teeth small, numerous, in pavement. Gill openings small, inferior. Spiracles superior. Skin usually more or less rough with small sharp spines and larger tubercles. Males with erectile spines near middle of upper side of each pectoral. Electric organ rudimentary. Dorsals small, usually two, behind midlength of tail. Males often with large claspers.

A large family, with numerous species mostly in cool seas or in deep water, usually difficult to distinguish. Sexual dimorphism usually greatly contrasted. So far as known the species are viviparous, the eggs deposited in large leathery four-angled cases or capsules, with two long tubular horns at each end. Fossils are known from the Cretaceous and later formations.

ANALYSIS OF GENERA

a^1. Rostral cartilage extended from skull, pointed; pectorals widely separated in front ---------- **Raja**

a^2. Rostrum soft and flexible; pectorals narrowly separated behind short rostral process ---------- **Psammobatis**

Genus RAJA Linnaeus

Raja LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 231, 1758. (Type, *Raja clavata* Linnaeus, designated by Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, p. 36, 1882.)

Raia SCOPOLI, Introd. Hist. Nat., p. 464, 1777; Index Animal., p. (6), 1787; BONNATERRE, Tabl. Ichth., p. 4, 1788. (Type, *Raja clavata* Linnaeus.)

Leiobatus KLEIN, Neuer Schauplatz, vol. 1, p. 316, 1775 (species nonbinomial). (Type, *Raja oxyrinchus* Linnaeus, designated by Jordan and Evermann Genera of Fishes, pt. 1, p. 36, 1917. Inadmissible.)

Dipturus RAFINESQUE, Caratteri animali piante Sicilia, p. 16, 1810. (Type, *Raja batos* Rafinesque=*Raja batis* Linnaeus, monotypic.)

Cephaleutherus RAFINESQUE, Indice d'ittiologia siciliana, pp. 48, 61, 1810. (Type, *Cephaleutherus maculatus* Rafinesque, monotypic. Monstrosity.)

Platopterus RAFINESQUE, Analyse de la nature, p. 93, 1815. (Type, *Raja clavata* Linnaeus, virtually. *Platopterus* Rafinesque proposed to replace *Raja* Linnaeus.)

Dasybatus (not Klein) BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816. (Type, *Raja batis* Linnaeus.)

Dasybatis (not *Dasyatis* Rafinesque, 1810) BLAINVILLE, Faune Française, Poissons, p. 12, 1825. (Type, *Raja batis* Linnaeus, designated by Jordan and Evermann, Genera of fishes, pt. 1, p. 134, 1917.)

Propterygia OTTO, Nov. Act. Acad. Leop. Bonn., vol. 10, p. 112, 1821. (Type, *Propterygia hyposticta* Otto, monotypic. Monstrosity.)

Laeviraja BONAPARTE, Icon. Fauna Italica, Pesci, vol. 3, fasc. 6, 1834 (description). (Type, *Raja oxyrinchus* Linnaeus.)

Laeviraija BONAPARTE, Nuov. Ann. Mus. Bologna, No. 2, p. 203, 1838. (Type, *Raja oxyrinchus* Linnaeus.)

Batis (not Boie 1833 in birds) BONAPARTE, Mém. Soc. Sci. Nat. Neuchâtel, vol. 2, p. 7, 1839; Cat. Metod. Pesci Europei, p. 12, 1846. (Type, *Raja radula* Delaroche, monotypic.)

Hieroptera FLEMING, Philosoph. Journ. Edinburgh, vol. 31, p. 236, pls. 4–5, 1841. (Type, *Hieroptera abredonensis* Fleming, monotypic. Monstrosity.)

Actinobatis AGASSIZ, Poissons fossiles, vol. 3, p. 372, 1843. (Type, *Raia (Actinobatis) ornata* Agassiz.)

Eleutherocephalus AGASSIZ, Nomenclatoris zoologici index universalis, pp. 71, 136, 1846. (Type, *Cephaleutherus maculatus* Rafinesque.)

Peroptera GISTEL, Naturg. Thierreichs, 1848, p. x. (Type, *Hieroptera abredonensis* Fleming, virtually.) (*Peroptera* Gistel apparent misspelling for *Hieroptera* Fleming.)

Perioptera GISTEL, idem. (Type, *Hieroptera abredonensis* Fleming, virtually.) (*Perioptera* Gistel apparent misspelling for *Hieroptera* Fleming.)

Amblyraja MALM, Göteborgs Bohusl. Fauna, p. 607, 1877. (Type, *Raja radiata* Donovan.)

Leucoraja MALM, Göteborgs Bohusl. Fauna, p. 609, 1877. (Type, *Raja fullonica* Linnaeus.)

Alpharaia LEIGH-SHARPE, Journ. Morphol., vol. 39, pp. 567, 568, 1924. (Type, *Raia circularis* Couch, orthotypic.)

Betaraia LEIGH-SHARPE, Journ. Morphol., vol. 39, pp. 567, 568, 1924. (Type, *Raja clavata* Linnaeus, orthotypic.)

Gammaraia LEIGH-SHARPE, Journ. Morphol., vol. 39, pp. 567, 571, 1924. (Type, *Raja batis* Linnaeus, orthotypic.)

Deltaraia LEIGH-SHARPE, Journ. Morphol., vol. 39, pp. 567, 573, 1924. (Type, *Raia radiata* Donovan, orthotypic.)

Epsilonraia LEIGH-SHARPE, Journ. Morphol., vol. 39, pp. 568, 574, 1924. (Type, *Raia platana* Günther, orthotypic.)

Zetaraia LEIGH-SHARPE, Journ. Morphol., vol. 39, pp. 568, 575, 1924. (Type, *Raia brachyura* Günther, orthotypic.)

Etaria LEIGH-SHARPE, Journ. Morphol., vol. 39, pp. 568, 576, 1924. (Type, *Raja murrayi* Günther, orthotypic.)

Thetaraia LEIGH-SHARPE, Journ. Morphol., vol. 39, pp. 568, 577, 1924. (Type, *Raja eatoni* Günther, orthotypic.)

Iotaraia LEIGH-SHARPE, Journ. Morphol., vol. 39, pp. 568, 577, 1924. (Type, *Raia marginata* Lacépède, orthotypic.)

Disk partly circular to quadrangular. Tail with fold along each side. Snout more or less produced and pointed, with strong extension from skull as rostral cartilage. Eyes prominent, with fimbriate velum above pupil. Mouth transverse, nearly straight. Teeth small, tessellate, variably flat to sharply pointed. Nostrils with two valves, front wide and reaches mouth, posterior folded in tube; nasoral groove to each nostril. Gill openings small. Spiracles close to eye. Skin usually more or less spiny. Caudal electric organs often present or rudimentary. Two rayed dorsals on tail above. Caudal membranous, rudimentary or absent. Pectorals widely separated at snout, not confluent. Ventrals notched.

A large genus with many species, upward of 80 living and 25 fossil. Some of the living forms reach a width of 7 or 8 feet. Distributed in northern and southern hemispheres, many ranging into deep water. The sexes are usually well differentiated. The males are more spiny, with patches of erectile spines on the pectorals above and with claspers, the last sometimes enlarged. Their coloration closely resembles the sea bottom, on which they dwell. As they lie concealed in the gravel or sand they await small marine animals, as crustaceans, worms, squids, fishes, etc. Suddenly darting over their victim and covering it with their wide body and fins, it is readily devoured. The egg cases are quadrangular, each angle with a point but without tendrils. The embryo leaves the egg soon after its exclusion or even during its transmission through the cloaca of the female.

Raja punctata Woodward[8] is apparently a nomen nudum.

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[8] Western Australian Year Book, vol. 1, 1900–1901, p. 273, 1902 (Freemantle).

Raja polyommata Ogilby[9] I have been unable to locate from Ogilby's original citation for 1910. The type is No. I. 1540 in the Queensland Museum.

The following egg cases may pertain to unidentified species of *Raja*:

4436. D. 5313. 21°30′ N., 116°43′ E. (China Sea, vicinity of Hongkong). November 1908. Length, 75 mm.

D. 5526. Balicasag Island (C.), N. 15° W., 18.4 miles (9°12′45″ N., 123°45′30″ E.), between Siquijor and Bohol Islands. August 11, 1909. Length, about 95 mm.

4251. D. 5587. Sipadan Island (W.) S. 12° E., 3.8 miles (4°10′35″ N., 118°37′12″ E.), Sibuko Bay, Borneo. September 28, 1909. Length, 70 mm.

4090. D. 5656. Olang Point, N. 67° W., 14.5 miles (3°17′40″ S., 120°36′45″ E.), Gulf of Boni, Celebes. December 19, 1909. Length, 92 mm.

ANALYSIS OF SPECIES

- a^1. Teeth in less than 50 rows.
  - b^1. Large bucklerlike spines in female, mostly absent in male .... clavata
  - b^2. Body without large bucklerlike spines in female, none in male.
    - c^1. Body largely smooth.
      - d^1. Snout abruptly narrowed into long sharp point; median row of spines on tail .... tengu
      - d^2. Snout not greatly extended and narrowed in long sharp point.
        - e^1. Lower surface of disk dark or at least partly dark.
          - f^1. Row of median vertebral thorns on back and tail.
            - g^1. Pale above; dark below .... reversa
            - g^2. Dark above and below .... atriventralis
            - g^3. Brown above, with or without white spots; below whitish or blotched black .... smithii
          - f^2. Row of median vertebral thorns on tail only, also series may be present each side.
            - h^1. Uniform brown or spotted white; pectoral and ventral fins with dark to blackish broad borders both above and below, especially in young .... alba
            - h^2. Uniform dark above and below; young with dark ring at each pectoral base and yellowish white below, outer half of each pectoral dark .... fusca
            - h^3. Smoky black above; black, mottled white, below. johannis-davisi
        - e^2. Lower surface of disk pale or whitish.
          - i^1. Only single row of regular medial vertebral spines.
            - j^1. No ocellus or dark blotch at each pectoral base above.
              - k^1. Uniform brownish above.
                - l^1. Southern Australia and New Zealand .... lemprieri
                - l^2. Okhotsk Sea .... smirnovi
              - k^2. Finely and entirely dotted dark above .... hollandi
              - k^3. Upper surface brownish, with traces of small pale spots. barnardi

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[9] "Some new Queensl. Fish., 20, Dec. 1910, p. 86: Cape Moreton, S. Q.," Mem. Queensland Mus., vol. 5, p. 86, 1916 (Cape Moreton to North Reef in 70 fathoms).

*j*². Ocellus or dark blotch above at each pectoral base.
    *m*¹. Entirely with irregular, waved or reticulated dark lines, form cluster at each pectoral base. **katsukii**
    *m*². Disk with pale spots, often black blotch at each pectoral base---------------------------- **kenojei**
    *m*³. Dark blue-black ocellus at each pectoral base above; with or without small dark spots, sometimes ocellate.
        *n*¹. Eye greater than firm interorbital space. **miraletus**
        *n*². Eye less than firm interorbital space-- **ocellifera**
*i*². Three rows of vertebral spines on back and tail. **caudaspinosa**

*c*³. Body largely roughened above, smooth areas small, inconspicuous or absent.
    *o*¹. Body partly or wholly dark on lower surface.
        *p*¹. Row of vertebral spines only on tail and row each side; gray above, chocolate below. **annandalei**
        *p*². Row of vertebral spines on back and tail.
            *q*¹. Uniform jet-black----------- **mamillidens**
            *q*². Reddish brown above and below, latter with whitish around mouth and abdomen. **durbanensis**
            *q*³. Brownish gray above, brownish black below------------------------ **isotrachys**
            *q*⁴. Purplish brown above; below white, hind disk edges and ventrals broadly blackish. **tobae**
            *q*⁵. Purplish brown with few irregular black spots; white below, with few dusky spots, margins gray------------------ **kujiensis**
    *o*². Body with under surface entirely pale or white.
        *r*¹. Single row of vertebral spines only on tail.
            *s*¹. Uniform brown above--------- **nasuta**
            *s*². Brown, with darker or lighter spots; with or without yellowish ocellus at each pectoral base--------- **murrayi**
        *r*². Single row of vertebral spines on back and tail; pale brown, blotched darker brown and white, latter may form narrow lines and tail transversely banded. **plutonia**
        *r*³. Band of fine vertebral spines on back and tail; brown above, white below. **sibogae**

*a*². Teeth in more than 50 rows.
    *t*¹. Upper surface of body largely smooth.
        *u*¹. Median line of vertebral spines present, at least on tail.

- *v*¹. Pectoral without distinct basal ocellus.
  - *w*¹. Uniform brownish gray above; below white; 5 irregular rows of spines on tail________________ lintea
  - *w*². Brown or dark greenish brown, uniform or with white and dark spots; below gray with dark specks; 1 to 3 rows of spines on tail. batis
  - *w*³. Uniform brown or with many round dark spots, 1 near pectoral base usually more prominent, larger, and bordered by light ring; below light with irregularly shaped dark blotches on pectorals and ventrals; median row of vertebral spines on tail, sometimes 1 or 2 rows each side posteriorly. naevus
- *v*². Pectoral with distinct basal ocellus each side of middle of disk.
  - *x*¹. Uniform brown above; 3 somewhat irregular rows of spines on tail__ philipi
  - *x*². Warm brown; 2 or 3 rows of spines on tail__ powelli
- *v*³. Brown, uniform, or with numerous darker brown spots, or few large white spots, more or less ocellate on pectoral base; median irregular rows of spines on back, 5 rows on tail. oculata

*u*². Median line of back and tail without spines; brown, uniform or with darker spots or light dark-edged ocelli; young usually with round black spot marbled yellow at each pectoral base; teeth 70 to 80__________ quadrimaculata

*t*². Back largely rough.

- *y*¹. Single median vertebral row of spines on back and tail.
  - *z*¹. Uniform slate gray above and below. andamanica

z^2. Dusky brown, with numerous dark brown or blackish variable spots; pale uniform yellow below. leopardus

z^3. Light brown, marbled dark brown; dark brown blotches ornamented by small, round, yellowish ocelli____________ nitida

y^2. Median vertebral spines in 3 or 4 rows on back and 3 to 5 rows on tail; brown above, snout white; below whitish, tinged brown__ porosa

y^3. No median large vertebral spine on back or tail; pale slate gray, becomes darker toward inner pectoral edges, lower surface of body similar. spinacidermis.

RAJA CLAVATA Linnaeus

Raja clavata Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 232, 1758 (type locality: European Ocean).—Günther, Cat. Fishes British Mus., vol. 8, p. 456, 1870 (Europe, Madeira, Mauritius ?).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Bonaparte material).

Raia clavata Garman, Mem. Mus. Comp. Zool., vol. 36, p. 326, 1913 (Norway to Madeira, Mediterranean).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 64, pl. 4, fig. 2, 1925 (Natal).

Dasybatis clavata Bonaparte, Icon. Fauna Ital., Pesci., vol. 3, pt. 2, fasc. 29, descr., pl., fig. 4 (male), 1840 (Italy); Cat. Metod. Pesci. Europei, p. 12, 1846 (Mediterranean; Atlantic).

Raja rubus Bloch, Fische Deutschlands, vol. 3, p. 67, pl. 84, 1784 (type locality: North Sea; Hamburg).

Raja cuvieria Schneider, Syst. Ichth. Bloch, p. 367, 1801 (on *La Raie Cuvier* Lacépède, Hist. Nat. Poiss., vol. 1, p. 141, pl. 7, fig. 1, 1798, type locality: Fiquainville près de Vallemont).

Raia aspera Risso, Ichth. Nice, p. 5, 1810 (type locality: Nice).

Raja pontica Pallas, Zoogr. Rosso-Asiat., vol. 3, p. 58, pl. 8, a–b, 1811 (type locality: Littore Tauriae).

Raja capensis (not Gmelin) Müller and Henle, Syst. Beschr. Plagiostomen, p. 151, 1841 (Cape of Good Hope).—Gray, List fish British Museum, p. 112, 1851 (reference).—Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 21, p. 58, 1860 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 540, pl. 12, fig. 11–12 (tubercle of tail), 1865 (type).—Kner, Reise *Novara*, Fische, p. 419, 1865 (Cape of Good Hope).

Raia capensis Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—Thompson, Marine Biol. Rep. South Africa, No. 2, p. 157, 1914.—von Bonde and

Swart, Fishes Marine Surv. South Africa, Spec. Rep. No. 5, p. 4, 1923 (off Natal, 146–160 fathoms).

Raia rhizacanthus Regan, Ann. Natal Gov. Mus., vol. 1, p. 3, pl. 2, 1906 [type locality: Natal coast, in 40 fathoms (young)]; 1908, p. 242 (Bird Island).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, pt. 3, p. 286, 1916 (reference).—Von Bonde and Swart, Marine Biol. Surv. South Africa, Rep., pt. 3, 1922, p. 5, 1924 (compiled).

Raja rhizacanthus Norman, *Discovery* Rep., vol. 12, p. 40, 1935 (Kalk Bay, False Bay, Agulhas Bank, off Cape St. Blaize; Bird I., Natal).

Raja bonae-speiensis Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 468 (on Müller and Henle; specific name lapsus for *bonae-spei*).

Raia ocellifera (part) Garman, Mem. Mus. Comp. Zool., vol. 36, p. 365, 1913 (on Müller and Henle, and Regan).

Snout $1\frac{1}{3}$ to $1\frac{5}{13}$ in head; mouth width $1\frac{3}{4}$ to $2\frac{2}{7}$; preoral length $1\frac{2}{7}$ to $1\frac{2}{3}$?; internarial $1\frac{4}{5}$ to $2\frac{7}{8}$; orbit 1 to 2 ? in interorbital; upper teeth 32 to 44, lower 33 to 41; interorbital $3\frac{1}{5}$ to $4\frac{1}{3}$ in head.

Males have but few spinous bucklers above or below and quite rough, one female with 79 spiny bucklers below. Spines on tail of male not developed to any extent anteriorly though on females extending to dorsal. Females quite rough. Several young examples differ from adults in having only medial vertebral tail and back spines. Also single small spine on each side of back medially. Superciliary spines usually 2 in front, behind usually 1, also pair between spiracles. Body above entirely rough, with fine asperities.

First dorsal length $1\frac{3}{7}$ to $3\frac{2}{7}$? in head; front ventral edge $1\frac{2}{3}$ to $1\frac{9}{10}$.

One female mottled with deeper brown blotches or spots than body color above.

South Africa, Natal, Mauritius ?

7 examples. A.N.S.P. Italy. C. L. Bonaparte. Nos. 80, 83, 231, 227. Length, 287 to 750 mm., width 175 to 517 mm.

RAJA TENGU Jordan and Fowler

Raja tengu Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 654, fig. 8, 1903 (type locality: Matsushima Bay; Aomori; Hakodate).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 110, 1925 (description in key).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference).

Raia pulchra Lin, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 162, figs. 10-10a, 1932 (type locality: Tsingtao).

Depth 20 to end of tail; head $3\frac{4}{5}$; disk length $1\frac{1}{5}$ its width, tail less than disk. Snout $1\frac{2}{5}$ in head, long, slender; eye 9, 8 in snout, $2\frac{2}{3}$ in interorbital; dentary width $3\frac{1}{4}$ in head; teeth in 28 rows in jaws, small, each with low cusp or keel; nostrils small, front nasal valve small, twice size of inner, internarial equals dentary width; interorbital $3\frac{1}{4}$ in head, depressed. Gill openings small, subequal, equidistant. Spiracle large as eye and close behind.

Body largely smooth. Two strong preocular spines, 1 above each spiracle, 1 occipital and median vertebral row begins on tail over ventrals, as 13 to first dorsal and 2 in interdorsal.

First dorsal broad, rounded, length 4 in head; second dorsal similar, length 4¼; caudal low cutaneous fold from second dorsal to end of tail; pectoral quite convex in outline; ventral length 2 in head.

Rather warm brown above, with variable large paler blotches, ill defined and mostly faint. Below whitish.

Japan. Known by its long slender snout, among the Japanese species. The coloration of the young suggests that of *Raja kenojei* in the obscure or pale blotches.

U.S.N.M. No. 50813. Station 3770, Japan. *Albatross* collection. Length, 217 mm.

RAJA REVERSA Lloyd

Raia reversa Lloyd, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 310, 1906 (type locality: Arabian Sea off Beluchistan coast, in 820 fathoms); Illustr. Zool. *Investigator*, Fishes, pt. 9, pl. 39, pl. 41, fig. 2, 1908; Mem. Indian Mus., vol. 2, p. 141, 1909 (type).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 354, 1913 (compiled).

Head to spiracle 5⅘ in total length; disk $1\frac{1}{12}$ in its width, tail $1\frac{1}{10}$ in disk length. Snout 1⅙ in head to spiracle, prominent, moderately exserted; eye 6⅔ in head, 5⅘ in snout, 3 in interorbital; mouth width 2½ in head to spiracle, 2¼ in preoral length, outer portions transverse, curved medianly; 42 rows of teeth in each jaw, median teeth long, curved, bases heart shaped; internasal $1\frac{9}{10}$ in preoral length or $2\frac{1}{10}$ in head to spiracle, hind edge of each broad flap at mouth corner fimbriate; interorbital 2⅓ in head to spiracle, firm cartilaginous interspace 3⅗. Spiracles oblique, close behind and equal eye.

Skin over skull but not over snout, covered with fine denticles; front half or more of pectorals covered with small denticles; 2 series of larger spines on each pectoral, 1 series of about 20 opposite shoulder girdle and another of about 15 opposite eye; large white stellate spine before eye and 2 or 3 smaller behind eye; 4 or 5 similar spines in mid-dorsal line; on upper surface of tail 3 regular rows of large spines, those in median row half numerous as in lateral rows and sides of tail spiny; lower surface of disk and tail smooth.

Dorsals joined basally, separated by narrow notch, caudal as low fold from second dorsal; dorsals subequal, first 2⅗ in head to spiracle; pectorals form broad rhomboid disk, front edges undulate, outer angle broadly rounded, hind angle rounded.

Upper surface when fresh pure white, passing into dark gray at pectoral margins. Upper surfaces of ventrals and claspers gray. Iris black, pupil milk white. Entire lower surface purplish black. Length, 600 mm. (Lloyd.)

Arabian Sea. According to Lloyd the consistency of the whole body soft and flabby and when taken from the trawl it was rolled up in a cylindrical posture.

RAJA ATRIVENTRALIS Fowler

FIGURE 11

Raja atriventralis FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 241, fig. 5, 1933 (type locality: Japan).

Depth 15⅖ to 16⅗ to end of tail; head 3⅗ to 4⅗; disk length 1⅕ to 1¼ in its width; tail little shorter than disk length. Snout 1⅗ to 1¾ in head, tip little produced and end rounded; eye 8⅗ to 9, 5⅖ to 5⅔ in snout, 3 to 3⅕ in interorbital; dentary width 2 to 2¾ in head; teeth in 48 (38) rows above, 44 (34) rows below, in male each with narrowly triangular and moderately long cusp, in female much lower, obtuse and with only low rudiment of cusp; nostril moderate, internarial space 1⅓ in dentary width, sections of outer valve subequal; interorbital 2¾ to 3 in head, broadly concave. Gill openings small, equidistant, subequal or last little shortest. Spiracle transverse, equals eye, front inner edge with fringe of small papillae.

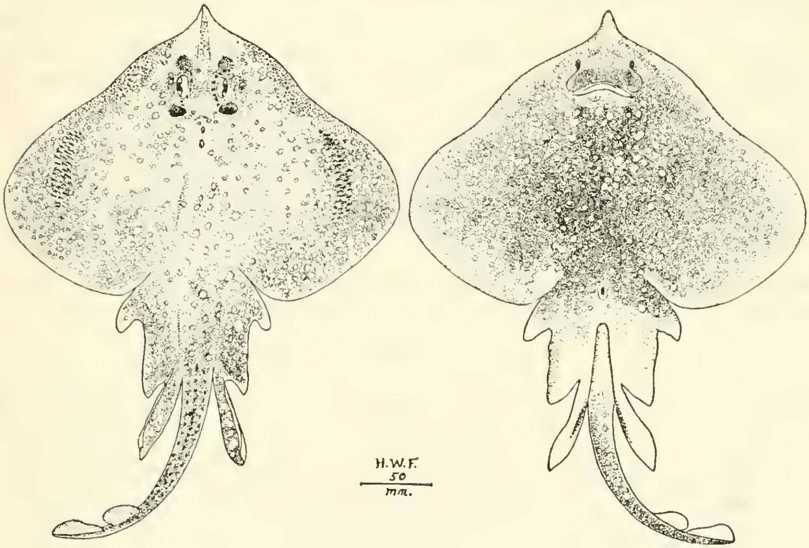

FIGURE 11.—*Raja atriventralis* Fowler: Type (U.S.N.M. No. 75876).

Skin smooth. In male row of small thorns at front of eye continued over supraorbital ridge back to spiracle, at occiput 2 thorns, on tail median vertebral row of 24 thorns to first dorsal and 3 in interdorsal with row of larger ones each side irregularly; 4 rows of erectile spines on each outer portion of pectoral; tip of snout both above and below and along upper front edge, asperous. Female smoother, with only lower surface of snout rough and larger thorns on tail.

First dorsal 4⅘ to 5 in head, second dorsal 2⅘ to 5; caudal present in female only as short lobe 1½ length of first dorsal; pectorals form broad subquadrangular disk, front edge undulate, angles broadly convex; ventral 1 to 1⅗ in head, long clavate compressed claspers of male equal head length to second gill opening, with broad deep terminal lamina.

Largely brown above, male mottled, or more or less clouded with darker, distinctly mottled on outer portions of disk tail, ventrals and claspers. In addition very numerous variable small to minute pale dots, specks or spots inconspicuously scattered about. In female coloration of uniform appearance. Below entire surfaces smutty or brownish, nearly dark as above. In male under surfaces all specked, spotted or dotted over median surface of disk, with ill-defined paler spots or blotches, all very irregular and sometimes simulating cloudings.

Diagnosis.—Differs from *Raja kenojei* in its dark or soiled lower surface of the body.

U.S.N.M. No. 51296. Japan. Jordan and Snyder. Length, 565 mm. Female.
U.S.N.M. No. 75876. Japan? P. L. Jouy. Length, 400 mm. Male. Type.

RAJA SMITHII Müller and Henle

Raja smithii Müller and Henle, Syst. Beschr. Plagiostomen, p. 150, pl. 48, fig. 1, 1841 (type locality: South Africa).—Gray, List fish British Museum, p. 112, 1851 (reference).—Bleeker, Nat. Tijds. Nederland. Indië, vol. 21, p. 58, 1860 (Cape of Good Hope).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 553, 1865 (copied; probably not Bosphorus specimen).—Günther, Cat. Fishes British Mus., vol. 8, p. 467, 1870 (type).

Raja smithi Norman, *Discovery* Rep., vol. 12, p. 37 (lat. 33° 48′ S., long. 17° 29′30″E., in 235–402 m.), p. 40, 1935 (South Africa; type).

Raia smithii Garman, Mem. Mus. Comp. Zool., vol. 36, p. 366, 1913 (South Africa).—Von Bonde and Swart, Fisher. Marine Biol. Surv. South Africa, Rep. No. 3, 1922, p. 5, 1924 (compiled).—Barnard, Ann. South African Mus., vol. 21, p. 66, pl. 4, fig. 4, 1925 (Cape Point, 380–475 fathoms).

Raja eatoni Günther, Ann. Mag. Nat. Hist., ser. 4, vol. 17, 1876 (type locality: Royal Sound, Kerguelen's Land); Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 14, 1880 (Northeast Kerguelen Island).

Raia eatonii Garman, Mem. Mus. Comp. Zool., vol. 36, p. 365, 1913 (copied).

Head to spiracle 6 in total length; disk length 1⅖ in its width, tail 1⅕ in disk length. Snout 1¼ in head to spiracle, slightly produced and pointed, rostral cartilages separate nearly half their length; eye 6, 5 in snout, 3 in interorbital; teeth in 28 to 30 rows in jaws, not very close together, with points in both sexes; internasal nearly equals distance of nostril from snout tip; interorbital 1⅞ in head to spiracle, firm interspace 2⅘. Spiracle little oblique, close behind eye.

Upper surface with 4-rooted asperities on snout, interorbital, anterior, posterior and outer margins of pectoral, back, and tail; with or without spine before orbit; median series of spines on back and tail, former sometimes incomplete or absent; lower surface smooth.

Dorsals small, well separated; pectorals form rhomboid disk, front rays extend quite close up to snout point, front margin undulate, outer angle rounded, hind edge convex.

Brownish, with or without whitish spots. Lower surface white, sometimes blotched with black, also tail. Reaches 650 mm. (Barnard.)

South Africa, Kerguelen Island.

RAJA ALBA Lacépède

Raja alba Lacépède, Hist. Nat. Poiss., vol. 5, pp. 661, 663, pl. 20, fig. 1, 1803 (type locality: Rouen, France).—von Bonde and Swart, Fishes Marine Surv. South Africa, Spec. Rep., No. 5, p. 5, 1923.—Norman, *Discovery* Rep., vol. 12, pp. 37, 40, 1935 (Kalk Bay, Simonstown, Agulhas Bank, Cape St. Blaize; Bird I., Natal).

Raia alba Garman, Mem. Mus. Comp. Zool., vol. 36, p. 332, 1913 (coasts of Europe).

Raja rostrata (not Shaw and Nodder) Lacépède, Hist. Nat. Poiss., vol. 4, pp. 660, 672, 1802 (Rouen, France). (On Noël).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Bonaparte material).

Raja marginata Lacépède, Hist. Nat. Poiss., vol. 5, pp. 662, 663, pl. 20, fig. 2, 1803 (type locality: Dieppe, Liverpool, Brighton).—Bonaparte, Iconogr. Fauna Itali., Pesci, vol. 3, pt. 2, fasc. 6, descr., pl., fig. (2 of male), 1834 (Italy); Cat. Metod. Pesci Europei, p. 16, 1846 (Mediterranean and Atlantic).

Raia marginata Thompson, Marine Biol. Rep. South Africa, No. 2, p. 158, 1914.—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 65, pl. 4, fig. 1, 1925 (Walfish, Table and Algoa Bays, Natal).

Raia rostellata Risso, Ichth. Nice, p. 8, pls. 1–2, figs. 1–2, 1810 (type locality: Nice).

Raia bicolor (not Shaw) Risso, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 155, 1826 (Nice).

Laeviraja bramante Sassi, Nuov. Annal. Sci. Nat. Bologna, ser. 2, vol. 6, p. 387, 1846 (type locality: "Mare di Genova").

Raia stabuliforis (not Garman) von Bonde and Swart, Fisher. Marine Surv. South Africa, Spec. Rep. No. 3, 1922, p. 12, 1924 (Mossel Bay).

Head to spiracle 4 in total; disk length 1⅓ its width, tail 1⅛ in rest of body. Snout 1⅓ in head measured to spiracle, rostral cartilages separate not quite their basal quarter; snout end abruptly narrowed into long acute projection; eye 7½ in head to spiracle, 6 in snout, 2¾ in interorbital; teeth 40 to 46, with sharp points in male; internarial less than space from nostril to snout tip. Spiracles behind eye their diameter, about equal eye.

Upper surface smooth; spine usually before and one behind each orbit; median row of spines on tail, with another series each side; lower surface with small 4-rooted spines and asperities on snout and along front pectoral edge.

First dorsal about long as eye, well separated from second. Front pectoral edge deeply concave, disk edge undulate, hind edges broadly convex or even concave near outer angle, which triangular.

Brownish, uniform or more or less spotted with white, darker towards pectoral ends. Lower surface white, tail and edges of pectorals and ventrals often brownish or blackish, especially in young. Reaches 2,100 mm. (Barnard.)

South Africa. Also in the Eastern Atlantic and Mediterranean.

Snout 1¼ to 1½ in head; orbit 1$\frac{1}{10}$ to 1⅓ in interorbital; mouth width 1$\frac{9}{10}$ to 2⅓ in head; teeth in 38 to 41 rows above, 35 to 40 below; internarial 2⅙ to 2⅔ in head; preoral length 1⅙ to 1⅓; interorbital 3¼ to 4.

An anterior superciliary recurved spine and usually 1 posterior, sometimes absent; front disk edge below and median snout surface, also its edges, finely asperous.

First dorsal length 2⅗ to 3 in head; front ventral edge 1⅘ to 2.

Pectorals margined dusky in most examples.

6 examples. A.N.S.P. Italy. C. L. Bonaparte. Length, 225–335 mm.

RAJA FUSCA Garman

Raja fusca Garman, Proc. U. S. Nat. Mus., vol. 8, p. 42, 1885 (type locality: Japan).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 649, 1903 (copied).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 645, 1908 (Japan).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, No. 2, p. 110, 1925 (Toyama, Misaki, Yokohama market).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference).—Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., p. 11, figs. 2–3, 1931 (Misaki).

Raia fusca Garman, Mem. Mus. Comp. Zool., vol. 36, p. 349, pl. 24, figs. 4–5, 1913 (Yedo Bay).—Lin, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 163, figs. 11–11a, 1932 (Tsingtao).

Raja kenojei (not Müller and Henle) Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 337, 1900 (Tokyo).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 652, 1903 (Misaki, Tokyo, Wakenoura, Kobe, Tsuruga, Nagasaki).—Schmidt, Fishes Western seas Russia, p. 289, 1904 (Gensan).—Jordan and Starks, Proc. U. S. Nat. Mus., vol. 31, p. 515, 1906 (Port Arthur, Manchuria).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 646, 1908 (Japan).—Berg, Faune Russie, Poiss., vol. 1, p. 92, 1911 (Gensan).—Jordan and Thompson, Mem. Carnegie Mus., vol. 6, p. 208, 1914 (Schinabara, Misaki).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 112, 1925 (Toyama; Misaki; Yokohama).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Mokpo and Jinsen, Korea).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 590 (Tokyo), p. 579, 1930 (Hongkong).

Depth 17 to end of tail; head 3⅖, disk length 1⅙ in its width, tail 1½. Snout 1⅗ in head, elongate triangle, ends in extended slender tip; eye 7¼, 5 in snout, 2½ in interorbital; dentary width 3½ in head; teeth in 36 rows in jaws, each tooth with small low cusp; nostrils small, front valve moderate, internarial equals dentary width; interorbital 3½, depressed concavely. Gill openings equidistant, last smallest. Spiracle rather small, much less than eye and at hind edge of concavity close behind eye.

Skin largely smooth. Two small spines before each eye, 2 large ones along upper hind eye edge, large occipital one and median row of 13 vertebral on tail behind disk, continued as 1 in interdorsal. Broad lateral cutaneous fold each side of tail.

First dorsal 4½ in head; second dorsal 5¾; caudal ?; pectorals broad, form broad triangular disk, front edge of each slightly undulate, hind edges convex; ventrals moderate, with deep notch forming long point in front; claspers short, depressed, rather slender and pointed.

Brown above, uniform and snout translucent each side of rostral cartilages, buff in color. Entire under surface brown like back, also paler or more buff on snout.

Philippines, China, Japan, Korea.

8290 (D. 5388). Bagatao Island Light (outer), S. 86° E., 21 miles (12°51′30″ N., 123°26′15″ E.), between Burias and Luzon. March 4, 1909. Length, 303 mm., caudal tip broken off.

RAJA JOHANNIS-DAVISI Alcock

Raja johannis-davisi Alcock, Cat. deep-sea Fishes *Investigator*, p. 21, 1899 (type locality: Travancore coast, in 224–284 fathoms); Illustr. Zool. *Investigator*, pl. 27, figs. 2–2a, 1899.—Brauer, Deutsch. Tiefsee Exp. *Valdivia*, vol. 5, p. 367, 1906 (reference).

Raia johannis-davisi Garman, Mem. Mus. Comp. Zool., vol. 36, p. 355, 1913 (compiled).

Head to first gill opening 3⅔ in total; disk length 1⅕ its width, slightly larger than tail. Snout 1⅗ in head, slender, much exserted; eye 7, 4⅓ in snout, 1⅔ in niterorbital; mouth width 2⅘ in head, straight; teeth obtusely pointed in male, about 32 very oblique upper rows, 30 below; nostrils large, internarial 2½ in preoral length, which 1⅖ in head; interorbital 3⅘. Spiracles close behind eye, oblique, ⅔ eye.

Disk smooth except star-shaped prickles on ventral surface of rostral cartilage and snout edges and adjacent part of pectorals; 2 strong preorbital and 1 postorbital; very strong spine in middle of nape; tail smooth except middorsal row of large spines to second dorsal base.

First dorsal 5 in head, second dorsal slightly smaller and confluent with caudal; first dorsal base about equals interdorsal space; pectorals form rhomboidal disk, front edges nearly straight or only slightly undulate, outer angles rounded, hind ones broadly rounded; ventrals deeply notched.

Smoky black above. Black mottled with white below. Length, 263 mm. (Alcock.)

India.

RAJA LEMPRIERI Richardson

Raia lemprieri Richardson, Voy. *Erebus* and *Terror*, Fishes, p. 34, pl. 23, 1846 (type locality: Port Arthur, Van Diemens Land).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 552, 1865 (compiled).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 17, 1888 (Hobart, Tasmania).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 364, 1913 (compiled).

Raja lemprieri Gray, List fish British Museum, p. 112, 1851 (reference).—Günther, Cat. Fishes British Mus., vol. 8, p. 463, 1870 (compiled).—Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 224, 1872 (Victoria); Rec. London Internat. Exhib., pt. 7, No. 5, p. 17, 1873 (Victoria).—Klunzinger, Sitzungsber. Akad. Wiss. Wien, math.-nat. Cl., vol. 80, pt. 1, p. 428, 1880 (Murray River).—Macleay, Proc. Linn. Soc. New South Wales, vol. 5, p. 311, 1880 (Tasmania; Port Phillip).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 45, 1890 (Victoria).—Waite, Rec. South Australian Mus., vol. 2, p. 29, fig. 42, 1921.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

Raya lemprieri Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 7, 1873 (Hobsons Bay).

Raja lamprieri Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 375, 1881 (Tasmania; Port Phillip).

Raia acutidens Owen, Cat. Osteol. Roy. Coll. Surg., vol. 1, p. 106, 1853 (type locality: South Australia).—Whitley, Rec. Australian Mus., vol. 18, p. 234, 1932 (reference).

Raia parvidens Owen, Cat. Osteol. Roy. Coll. Surg., vol. 1, p. 106, 1853 (type locality: South Australia).—Whitley, Rec. Australian Mus., vol. 18, p. 234, 1932 (reference).

Raia molaridens Owen, Cat. Osteol. Roy. Coll. Surg., vol. 1, p. 106, p. 107, 1853, (type locality: South Australia).—Whitley, Rec. Australian Mus., vol. 18, p. 234, 1932 (reference).

Raia dentata Klunzinger, Arch. Naturg., vol. 38, p. 46, 1872 (type locality: Port Philip, Australia).

Raja dentata Klunzinger, Sitzungsber. Akad. Wiss. Wien, math.-nat. Cl., vol. 80, pt. 1, p. 429, 1880 (Port Phillip).—Macleay, Proc. Linn. Soc. New South Wales, vol. 9, p. 63, 1884 (Port Phillip).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 46, 1890 (reference).

Raja australis Macleay, Proc. Linn. Soc. New South Wales, vol. 8, 1883, p. 461, 1884 [(type locality: Off Botany Bay, in 40 to 55 fathoms). ("Dove")]; vol. 9, p. 63, 1884 (outside Port Jackson, 50 fathoms).—Waite, Mem. Australian Mus., vol. 4, p. 40, pl. 4, 1899 (New South Wales).—McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 10, 1911 (Shoalhaven Bight, New South Wales); Fishes New South Wales, ed. 2, p. 11, pl. 3, fig. 35a, 1927.—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 129, 1925 (reference).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

Raia australis Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 18, 1888 (type: Port Jackson); Mem. Queensland Mus., vol. 5, p. 86, 1916 (Cape Moreton).

Head to first gill opening 4½ to end of tail; disk length 1⅒ its width, tail ¾ disk length. Snout 1⅗ in head; eye 6⅗, 4½ in snout, 2 in interorbital; mouth width 2⅓ in head, curved; teeth round disks with central conic cusp; preoral length 1¾ in head; nostrils large, about last ⅖ in preoral length, internasal half preoral length; interorbital 3⅗ in head. Spiracles large, oblique, along hind eye edge, little larger than eye or long as orbit.

Small denticles on upper parts rough on snout end, rostral cartilages, interorbital, front edges of disk and pectorals; group of small tubercles at front inner portions of pectorals, row on orbital ridge and vertebral row from behind eyes to dorsals, somewhat broken behind center of disk and as more irregular rows along each side of tail above. Males with band of 2 or 4 series of depressible spines on outer portion of each pectoral.

Dorsals subequal, each equals combined eye and spiracle, interdorsal about half first dorsal base; pectorals form broad disk, front edges undulate, outer angle broadly convex, likewise hind angle; ventral deeply notched.

Blackish gray above, lateral regions of snout and pectoral edges flesh colored, under surface almost entirely white. Tip of snout above and below and point of tail beneath, black. Length, 480 mm. (Richardson.)

South Australia, Tasmania, Victoria, New South Wales, Queensland. Waite also notes the males with the teeth acutely spinous, in females nowhere spinous. Disk of male much more spiny and single median vertebral spine above, little above disk center. Single spine in interdorsal space. In female large patch of spines at front of pectorals absent and tail with 5 rows of spines. Waite notes the color of this species with scattered brown spots on the under side of the disk and yellow marks at the bases of the disks and on the ventral fins. Also the numerous pores on the underside of the snout and head black. One from New South Wales in the Queensland Museum.

RAJA SMIRNOVI Soldatov and Pawlenko

Raja smirnovi Soldatov and Pawlenko, Ann. Mus. Zool., Acad. Imper. Sci. Petrograd, vol. 20, No. 1, p. 162, pl. 5, 1915 (type locality: Peter the Great Bay; Okhotsk Sea in lat. 58° 38′ N., long. 152° 45′ E., in 69 fathoms).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 111, 1925 (Fukui on Japan Sea; Takashima).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 21, pl. 1, 1930 (Far East Seas).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 262, fig. 21, 1932 (Chefoo).—Taranetz, Western Branch Acad. Sci. U.S.S.R. No. 13, pp. 90, 91, 1935 (note).

Raja omiruovi Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference; typographical error).

Raja binoculata (not Girard) Schmidt, Pisces marinum orientalium, p. 291, 1904 (Far East Seas).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 502, 1930 (reference).

Raja meerdervoorti (not Bleeker) SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (part).

Head to spiracle 6 in total length; disk length 1⅖ its width, tail about ⅚ disk length. Snout 1⅓ in head to spiracle, broad, not extended at tip, angle slightly obtuse; eye 7 in head to spiracle, 4⅓ in snout, 3 in interorbital; interorbital 2¼ in head to spiracle, broad, concave. Spiracle little oblique, close behind eye, equals eye.

Both upper and lower surfaces naked; only few minute spines or prickles present along front and hind borders of pectorals, on snout tip and on front and hind portions of orbit; 3 strong spines on middle of back in male, only 2 in female; 2 strong scapular spines, one each side of median line, in male as in female; no spines on middle of disk; tail with median row of 22 to 26 spines, wide band of coarser minute prickles on each side; under surface without spines and prickles. Wide lateral fold along each side of tail. Erectile pectoral spines well developed, usually radial, in 22 or 23 series and at most 6 or 7 hooks in series.

Dorsals high, subequal, about 2⅘ in head to spiracle, interdorsal very narrow deep notch, with spine in females; pectorals form broad rhomboidal disk, front edge broadly notched medially, outer and hind angles broadly convex; ventrals deeply notched.

Light brown above, whitish below, no spots or blotches. Length, 1,077 mm. (Soldatov and Pavlenko.)

Okhotsk Sea. Said to differ from *Raja binoculata* Girard in the absence of lateral spines on the tail. Described from 2 specimens, the larger a male taken as type.

RAJA HOLLANDI Jordan and Richardson

Raja hollandi JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 163, pl. 64, 1909 (type locality: Takao, Formosa).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference).

Raia hollandi GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 351, 1913 (compiled).

Head to spiracle 5¾ in total; disk length 1⅙ its width, slightly longer than tail. Snout 1⅙ in head to spiracle, not much produced, ending in small point; eye 5¾ in head to spiracle, 4¾ in snout, 2⅖ in interorbital; mouth width 1⅗ in snout, scarcely undulate; teeth small, rounded, about 45 rows above; nostrils confluent with mouth, hind edges of nasal flaps fringed; interorbital 2⅗ in head to spiracle, concave. Spiracles close behind eyes, oblique, about ⅘ of eye.

Supraorbital semicirclet of 8 or 10 short spines, directed backward; single median dorsal spine little farther behind eyes than interorbital; back and sides of tail with 5 rows of short backwardly directed spines; under snout edges till opposite first gill opening with numerous minute spines; body otherwise smooth.

First dorsal 3 in head to spiracle, second dorsal 3½, or 1¼ in interdorsal; caudal 2⅓ in head to spiracle; pectorals form broad rhomboid disk, front edges slightly undulate, outer angles broadly rounded, hind edges very slightly convex and hind angles broadly convex; ventrals deeply notched.

Brown above, lighter bluish to greenish beneath. Back and all upper surface, except tail and snout, densely covered with small black specks about size of coffee grains. Snout translucent, upper surface appearing whitish in reflected light. Numerous pores on under side of snout and sides of mouth each surrounded with black circle. Tail brownish above, paler with some dusky underneath. Length, 370 mm. (Jordan and Richardson.)

Formosa.

RAJA BARNARDI Norman

Raja barnardi NORMAN, *Discovery* Rep., vol. 12, p. 43, fig. 14, 1935 (type locality: Lat. 34° S., long. 17°58′ E., in 173–210 m., off Capetown).

Disk little broader than long, width scarcely ⅗ total length; front margins little undulated; outer angles smoothly rounded. Vent little nearer to snout tip than to end of tail. Snout with rather short, obtuse, triangular projection, its length 4½ in disk width. Interorbital equals eye; combined eye and spiracle 2⅔ in snout. Internarial width 2⅓ in preoral length of snout. Teeth more or less pointed in middle of jaws; rows 40 to 42.

Upper surface of disk and tail mainly smooth, but large patch of spinules on front part of each pectoral, and some scattered spinules on snout, interorbital, middle of back and hind parts of pectorals; 2 preocular and 4 postocular spines; 3 median nuchal spines, with smaller one on each side; single median spine above suprascapulary region; 2 scapular spines; 24 median spines extending from just behind suprascapulary region to first dorsal; front part of tail with somewhat irregular series of spines on each side; edges of tail with numerous small spines. Lower surface quite smooth except at edges of snout.

Upper surface brownish, with traces of small pale spots. Lower surface uniformly pale.

Length, 375 mm., 210 mm. across disk. (Norman.)

South Africa.

RAJA KATSUKII Tanaka

Raja katsukii TANAKA, Fishes of Japan, vol. 35, p. 662, pl. 154, figs. 426–428, 1927 (type locality: West coast Province Mutsu, Japan).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (compiled).

Head to spiracle 5⅓ in total; disk length 1⅕ in its width, tail 1⅓ in disk length. Snout 1⅕ in head to spiracle, slightly produced with rather bluntly pointed tip; eye 5⅘ in head to spiracle, 4⅔ in snout, 2⅛ in interorbital; mouth slightly waved, width 1¾ in preoral length from mouth corner; teeth above, flattish, paved, in 50 rows; front nasal valve tubular, hind flap slightly produced and recurved; hind nasal valve large, with fringes posteriorly; internarial 1½ in space between latter and snout tip; interorbital 2½ in head to spiracle. Spiracles directly behind eye, edges entire, little oblique, about equal eye.

Row of supraorbital spines each side, before eye and on inner spiracle edge; single median row of 3 spines on shoulder girdle; small group of very small spines at median line of snout somewhat near tip, on middle and posteriorly; 1 or 2 rows of weaker small irregular spines on sides near middle above abdomen, none on median line; rather small recurved biserial spines within hind lateral disk edge; 5 rows of spines on tail, supero-lateral row begins more anteriorly; interdorsal with 3 spines interspersed with several smaller ones between; body otherwise naked.

Two small dorsals, subequal, interdorsal equals dorsal bases; second dorsal well separated from rudimentary caudal; pectorals form rhomboid disk, front edge nearly straight, outer and hinder angles broadly rounded; ventrals rather shallowly notched.

Rusty red, profusely marked with brownish, irregularly curved continuous lines, forming ground color polygonal or irregular areas and spots. Opposite outer disk angle on each side near median line reticulated marking about equal to orbit, more or less surrounded by broad area of ground color. Under surface whitish, excepting median portion near snout tip, region around mouth and gill openings and sides of abdomen to ventral insertion, these all irregularly blotched and soiled darker. Length, 395 mm. (Tanaka.)

Japan. According to Taranetz this species is a synonym of *Raja kenojei.*

RAJA KENOJEI Müller and Henle

Raja kenojei (Bürger) Müller and Henle, Syst. Beschr. Plagiostomen, p. 149, pl. 47, 1841 (type locality: Southwest coast of Japan; Nagasaki market).—Richardson, Ichth. China Japan, p. 197, 1846 (Seas of China and Japan; Canton).—Schlegel, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 308, 1850 (Nagasaki).—Gray, List fish British Museum, p. 112, 1851 (reference).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Nagasaki; China); Act. Soc. Sci. Indo-Néerland., vol. 3, No. 3, p. 3 (Kioesio), p. 7 (Japan), p. 42, 1858; vol. 8, p. 65, 1860 (Nagasaki).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 556, 1865 (compiled).—Günther, Cat. Fish. Brit. Mus., vol. 8, p. 461, 1870 (Japan).—Peters, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).—Nyström, Svenska Vet. Akad. Handl., vol. 13, pt. 4, p. 51, 1887 (Nagasaki).— ? Elera, Cat. Fauna Filip., vol. 1, p. 620, 1895 (Luzon, Manila, Samar, Borongan, Paragua, Puerta Princesa).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 60, 1897.—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 646, 1908 (Japan).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 187, 1920 (Tokyo).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 113, 1925 (Misaki, Toyama, Miyazu).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (Japan); Hong Kong Nat., vol. 1, p. 136, fig. 18, 1930 (Japan).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 19, 1930 (Far East Seas).—Schmidt, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 11, 1931 (Nagasaki; Kagoshima; Misaki; Fusan).—Tanaka, Jap. Fish. Life Colours, No. 31, 1933.—Taranetz, Bull. Associate Acad. Sci. S.S.S.R., Nos. 1–3, p. 67, 1933.—Wang, Contrib. Biol. Lab. Sci. Soc. China, vol. 9, p. 105, fig. 7, 1933 (Chusan).—Taranetz, Bull. Associate Acad. Sci. S.S.S.R., No. 13, 1935 (note).

Raia kenojei Garman, Mem. Mus. Comp. Zool., vol. 36, p. 351, pl. 24, figs. 1–2, 1913 (Idzu Sea, Japan).

Raja meerdervoortii Bleeker, Act. Soc. Sci. Indo-Néerl., vol. 8, no. 1, p. 66, 1860 (type locality: Nagasaki).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 642, 1908 (Japan).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 187, 1920 (Agamushi).

Raja meerdervoorti Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).—Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Otaru, Mororan, Hakodate).

Raja japonica Nyström, Svenska Vet. Akad. Handl., vol. 13, pt. 4, p. 52, 1887 (type locality: Nagasaki).—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).

Raja smirnovi (not Soldatov and Pavlenko) Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 111, 1925.

Raja tengu (not Jordan and Fowler) Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 20, fig. 3, 1930 (Far East Seas).

Depth 13½ to 15 to end of tail; head 4¼ to 4½; disk length 1¼ to 1⅓ in its width and tail less than disk. Snout 1½ to 1⅗ in head, tip slightly produced and rounded; eye 4 to 4⅕ in snout, 2½ to 2⅞ in interorbital; dentary width 3 to 3⅛ in head; teeth in 30 to 45 rows in jaws, small, each with low cusp as keel; nostrils small, internarial space equals dentary width, front section of inner nasal valve little longer than hind valve; interorbital 2½ to 2⅗ in head, depressed concavely. Gill openings small, equidistant, subequal. Spiracle subequal with eye, close behind eye, edge without grooves.

Body largely smooth, especially with age. In young tubercles strong and prominent, 2 preocular, 1 above each spiracle, 1 occipital with median vertebral row beginning on tail about opposite ventral origins, continued as 10 to 13 spines to first dorsal and 1 or 2 in interdorsal; with age spines much less distinct and largely evident only on tail posteriorly.

First dorsal broad, length 3½ to 4 in head; second dorsal similar, 3⅓ to 4; caudal low, continuous fold from second dorsal; pectoral rather obtusely rounded; ventral length 1⅛ to 1½ in head; claspers broad, flat, extend ⅔ to hind ventral tips.

Brown above, in young with variable scattered obscure whitish spots, often variably clustered in middle of disk. At each side of middle of disk rounded to ellipsoid dark or dusky blotch, always larger than eye, sometimes with white or pale center, again as 2 dark rings with one inside the other. In addition sometimes a white blotch of similar size, with dark ring as border, may be present little outside and posterior, also small blackish blotch on hind part of pectoral near base. Large examples show body more uniform, without trace of dark spots, though often a white blotch may occur on each pectoral little behind its middle.

China, Japan. Though listed from several localities in the Philippines by Elera, no other records have ever been given and until they are established by unquestioned materials they had best remain as doubtful. I have followed Garman in placing *Raja meerdervoortii* Bleeker with this species. My specimens show a great range of variation in color markings with age.

6842. Kowloon, China. October 20, 1908. Bureau of Fisheries. Length, 435 mm. Tail with 5 rows of thorns. Blotchlike cluster of small dark spots on pectoral posteriorly and marginally.

1976 [189]. D 5310. Lat. 21°33′N., long. 116°13′ E., China Sea, vicinity of Hongkong. November 4, 1908. Length, 124 mm. Armature largely absent, mostly smooth. Cluster of dark spots opposite and close to eyes and another larger at middle of pectoral base, besides some dark spots in interorbital and few obscure umber spots about hind portions of pectorals.

1488. D. 5388. Bagatao Island Light (outer), S. 86° E., 21 miles (12°51′30″ N., 123°26′15″ E.), between Burias and Luzon. March 11, 1909. Like the following. Both armed as in Müller and Henle's plate. Disk above with very minute asperities, giving rough velvety touch. Length, 298 mm.

1488. D. 5326. Hermanos Island (N.), N. 69° E., 8 miles (18°32′30″ N., 122° 01′ E.). November 12, 1908. 2 examples. Length, 290 mm. Lower surfaces nearly dark as back or upper surfaces. Disk above largely smooth.

U.S.N.M. No. 22612. Miuramisaki, Japan. April 23, 1898. Japanese Government. Length, 482 mm.

U.S.N.M. No. 48198. Japan. S. Nozawa. Length, 173 mm.

U.S.N.M. No. 50731. Tokyo, Japan. Jordan and Snyder. Length, 266 mm.

U.S.N.M. No. 50732. Hakodate, Japan. Jordan and Snyder. Length, 200–222 mm. 3 examples.

U.S.N.M. No. 59797. Kagoshima, Japan. Dr. H. M. Smith. Length, 116 mm.

U.S.N.M. No. 59798. Kochi, Japan. Dr. H. M. Smith. Length, 200 mm.

U.S.N.M. No. 59800. Kagoshima. Dr. H. M. Smith. May 7, 1903. Length, 275 mm., very poor.

U.S.N.M. No. 71129. Japan. Bureau of Fisheries. Length, 187 mm.

U.S.N.M. No. 71801. Hakodate, Japan. *Albatross* collection. Length, 150 to 180 mm. 5 examples.

U.S.N.M. No. 71830. Tokyo market. *Albatross* collection. Length, 452 mm. Male with long clavate claspers, equal head measured to first gill opening.

U.S.N.M. No. 71904. Tokyo market. *Albatross* collection. Length, 470 mm.

U.S.N.M. No. 75875. Japan? P. L. Jouy. Two examples, 373 and 437 mm. Smaller male with long clavate claspers nearly long as head.

RAJA MIRALETUS Linnaeus

Raja miraletus Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 231, 1758 (type locality: Mediterranean Sea).—Bonaparte, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 3, descr., pl. fig. 2, 1833 (Italy); Cat. Metod. Pesci Europei, p. 14, 1846 (Mediterranean).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Bonaparte material).

Raia miraletus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 324, 1913 (off southern Europe).—VonBonde and Swart, Marine Biol. Surv. South Africa Rep. pt. 3, 1922, p. 5, 1924 (compiled).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 68, 1925 (Agulhas Bank, in 36 fathoms; Natal).

Raia bioculaгis Geoffroy Saint-Hilaire, Descr. Egypte, Poiss., vol. 1, pl. 24, fig. 2, 1809 (type locality: Egypt).

Raia percomaculata VonBonde and Swart, Marine Biol. Surv. South Africa Rep. pt. 3, 1922, p. 9, pl. 21, fig. 2, 1924 (type locality: Station 116, South Africa, in 298 fathoms).

Snout 1¼ to 1⅓ in head; orbit 1 to 1⅕ in interorbital; mouth width 2¼ to 2⅘ in head; teeth 32 to 41 above, 35 to 40 below; internarial 2⅓ to 2⅞ in head; preoral length 1⅙ to 1⅓; interorbital 4¾ to 6.

Spines before and behind eyes vary 1 to 3, on back medianly sometimes reduced to 1. In smaller examples median series on tail continuous till close up behind eyes and again additional 1 on each side of back anteriorly. In some cases median series on tail become rather reduced in size and inconspicuous in males. Large female with 5 series of large spines on back of tail anteriorly and another shows traces of same number.

First dorsal length 2½ to 3²⁄₇ in head; front ventral 1⅔ to 2.

South Africa, Natal. Also in the Atlantic.

12 examples. A.N.S.P. Italy. C. L. Bonaparte No. 224, also skeleton same data. Length 165 to 421 mm., width 96 to 263 mm.

RAJA OCELLIFERA Regan

Raia ocellifera Regan, Ann. Natal Gov. Mus., vol. 1, p. 2, pl. 2 (type locality: Algoa Bay and Natal coast, 40 fathoms), p. 242, 1906 (Bird Island).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 365, 1913 (South Africa).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, pt. 3, p. 286, 1916 (compiled).—Von Bonde and Swart, Marine Biol. Surv. South Africa Rep. pt. 3, 1922, p. 5, 1924 (compiled).—Barnhard, Ann. South African Mus., vol. 21, p. 67, 1925 (False Bay to Natal); vol. 21, pt. 2, p. 1015, 1927 (note).

Raja ocellifera Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 193 (Natal).—Norman, *Discovery* Rep., vol. 12, p. 42, 1935 (False Bay, Agulhas Bank, off Cape St. Blaize, Algoa Bay; Natal; types).

Raja capensis (not Gmelin) Müller and Henle, Syst. Beschr. Plagiostomen, p. 151, 1841 (type locality: Cape of Good Hope).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 540, pl. 12, figs. 11–12 (tubercle and spine), 1865 (types).—Kner, Reise *Novara*, Fische, p. 419, 1865 (Cape of Good Hope).

Raia capensis Von Bonde and Swart, Marine Biol. Surv. South Africa Rep., pt. 3, 1922, p. 4, 1924 (South Africa, in 146–160 fathoms).

Depth 2¼ in snout; head to first gill opening 2 in length to vent. Snout 1⅓ in head to spiracles, produced in short point; eye 2¾ in snout, 1⅘ in interorbital; mouth width 1¾ in preoral length; firm interorbital 2⅔ in snout.

Before each eye strong divergent spines and 1 close behind; strong median vertebral spine 1¼ in eye; down back of tail row of 10 spines to first dorsal, also spine between dorsals.

First dorsal opposite middle of tail; pectorals form disk length 1¼ in its width, front angle obtuse, front edges slightly undulate; tail to base little longer than disk length, 1⅓ in disk width.

Above chocolate, with variable scattered neutral dusky spots, few or obsolete toward disk margins and none oscellated. On caudal 5 transverse neutral dusky bands or blotches. Below whitish, margin of disk grayish.

South Africa, Natal.

1 example A.N.S.P. Natal. H. W. Bell Marley. Length, 183 mm.
2 egg cases A.N.S.P. Natal. H. W. Bell Marley. Length, 80 mm.

RAJA CAUDASPINOSA Von Bonde and Swart

Raia caudaspinosa Von Bonde and Swart, Marine Biol. Surv. South Africa Rep., pt. 5, p. 8, pl. 21, fig. 1, 1923 (type locality: Natal coast, in 280 fathoms).—Barnard, Ann. South African Mus., vol. 21, p. 66, 1925 (Natal).

Raja caudaspinosa Norman, *Discovery* Rep., vol. 12, p. 37, 1935 (lat. 34°8′ S., long. 17°33′ E., in 302?–548 m.; lat. 38°48′ S., long. 17°29′30″ E., in 235–402 m.).

Head to spiracle 7¼ in total; disk length 1⅓ its width, tail slightly longer than rest of body. Snout 1½ in head measured to spiracle, blunt, hardly produced, angle very obtuse; eye 3⅗ in head to spiracle, 2⅘ in snout, 2½ in interorbital; teeth in numerous rows, square based and sharp pointed; 3 suprascapulary spines each side from region 3 rows of large stellate-based spines extend all space to first dorsal where median series ends, lateral series continue to end of tail either side dorsal and caudal; spines gradually smaller towards end of tail; all way from shoulder to first dorsal spines of lateral series larger than median series; also on sides of compressed tail from root to nearly half way 2 belts of numerous, minute spines, belts narrowing until at middle of tail continued as single row of small spines to end of tail; outer nasal edges with grooved, fringed, long, projecting funnel-like flaps and fringed flaps over mouth corners; interorbital 1⅖ in head to spiracle, flat. Spiracles slightly inclined from horizontal, little less than eye and close behind.

Except smooth areas behind spiracles either side and either side median line above abdomen disk sparsely covered with stellate based spines; latter as 2 broad belts on front disk edges, rostrum, interorbital and orbital ridges, as triangular cluster behind head including region of shoulder girdle; on hind disk edges each side group of scattered spines, between groups and belts on front edges few scattered spines; 6 spines on orbital ridge.

Dorsals oval and caudal continuous along slightly raised median fold, no spine between dorsals, all 3 covered ¾ either side with small spines in belt from front part of base along dorsal margin of fins backwards. Pectorals form subcircular disk, front edges sinuous, slightly concave behind and convex in wide curve opposite eyes.

Uniform dusky gray or mud color. Lower surface white. Length, 346 mm. (Von Bonde and Swart.)

Natal.

RAJA ANNANDALEI Weber

Raja annandalei Weber, *Siboga* Exped., Fische, vol. 57, p. 598, 1913 (type locality: Between Kajoa and Batjan, in 397 m; Halmahera Sea, in 827 m).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (compiled).

Snout somewhat prominent; mouth transverse, bowed medially, width nearly half preoral; teeth in 40 to 42 rows, median bowed and longer than laterals, bases oval heart-shaped; interorbital somewhat less than ⅓ snout length from eye or from middle of mouth. Spiracle not large, diameter ⅔ horizontal eye diameter.

Whole back more or less covered with small denticles, absent each side of snout tip; large, curved, hooked thorns, on round bases, 3 in middle of snout, 2 or 3 before and 1 behind orbital edge, 1 above spiracle, 4 in mid-line of back; in middle of each pectoral group of 5 depressible; on upper side of tail 3 rows of thorns, 30 in median row and each side row with 25 or 26; upper side of tail with fine denticles; under side of disk and tail smooth.

Dorsals equally long and bases in contact; caudal low fold; pectorals form disk width greater than space between snout tip and caudal base; front pectoral angles scarcely sinuous, lateral angles rounded; cloaca nearly ¼ nearer snout end than caudal end.

Upper surface of body clear gray. Dorsals brownish. Under surface of body, including ventrals and tail, chocolate color. Disk length, 154 mm., width 190 mm. (Weber.)

East Indies. According to Weber young above dark gray, below whitish with reddish. Near *Raja reversa* Lloyd.

RAJA MAMILLIDENS Alcock

Raja mamillidens Alcock, Ann. Mag. Nat. Hist., ser. 6, vol. 4, p. 380, 1889 (type locality: Gulf of Manaar, in 597 fathoms); Illustr. Zool. *Investigator*, pl. 8, fig. 1, 1892; Cat. Deep Sea Fishes Indian Mus., p. 19, 1899 (type).

Raia mammillidens Garman, Mem. Mus. Comp. Zool., vol. 36, p. 350, 1913 (compiled).

Head to spiracle 6½ in total length; disk length 1$\frac{1}{12}$ its width or 2$\frac{1}{10}$ in total length. Snout 1⅙ in head to spiracle, short, broad, only slightly exserted; eye 6¼ in head to spiracle, 5⅔ in snout, 3¼ in interorbital; mouth crescentic; teeth in female with globular base and mammary point, 24 oblique rows in upper jaw, 18 in lower; interorbital 1⅗ in head to spiracle. Spiracle close behind along hind eye edge, nearly equals orbit.

Whole upper surface of disk, including ventrals and tail, all surfaces of posterior half of tail including dorsals and rudimentary caudal, covered with small, sharp, close set prickles; large spine at each angle of each orbit, pair between spiracles, 1 or 2 on each shoulder girdle each side center of disk and single row down middle of back from occiput nearly to first dorsal fin; under surface of disk smooth and glandular.

Dorsals adjacent, separate, posterior larger or about 2 in head to spiracle, interdorsal very narrow notch; pectorals form rhomboidal disk, angles rounded, front edges slightly and broadly sinuous.

In life uniform jet black, dark chocolate in spirit. Length, 292 mm. (Alcock.)

India. Known only from the type, a female in the Indian Museum.

RAJA DURBANENSIS Von Bonde and Swart

Raja durbanensis Von Bonde and Swart, Marine Biol. Surv. South Africa Rep., pt. 5, p. 11, pl. 22, fig. 1, 1923 (type locality: Natal coast, in 470 fathoms).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 69, 1925 (Natal coast).

Head to spiracle 6⅗ in total; disk length 1⅓ its width, 2⅓ in tail. Snout 1¼ in head measured to spiracle, front edges almost straight and meet at acute angle; eye 5 in head to spiracle, 4⅓ in snout, 2⅓ in interorbital; mouth nearly straight, 2⅓ in preoral length; teeth in numerous rows, rhombic based and slightly denticulate; outer nostril edges with funnel-shaped flaps and slight fringed flaps cover mouth corners; interorbital 2¼ in head to spiracle, flat. Spiracles small, oblique, close behind eyes, smaller than eyes.

Whole upper surface, including sides of tail, covered with small spines; under surface smooth; stellate based spine before each orbit and 2 behind; row of equally large median spines from behind head to tail to first dorsal; 2 suprascapular spines on each shoulder, 1 large and other small.

Dorsals separate, small, pointed, first little larger or 1⅔ in snout; caudal minute; pectorals form quadrangular to rhombic disk, front margins nearly straight, outer angles, posterior margins and angles broadly rounded; ventrals pointed posteriorly and notched about to middle.

Reddish brown. Dorsals, caudal, and lateral folds deep reddish brown. Under surface as above, except areas around mouth and abdomen, which white. Tail below like body. Length, 232 mm. (Von Bonde and Swart.)

Natal.

RAJA ISOTRACHYS Günther

Raja isotrachys Günther, Ann. Mag. Nat. Hist., London, ser. 4, vol. 20, p. 434, 1877 (type locality: Coast of southern Japan, in 365 fathoms); Rep. Voy. *Challenger*, vol. 22, p. 7, pl. 3, 1887 (lat. 34° 7′ N., long. 138°, E., in 365 fathoms).—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 649, 1903 (compiled).—Tanaka, Fishes of Japan, vol. 35, p. 670, pl. 155, figs. 430–432, 1927 (Mororan to Hokkaido, Kesen).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java. p. 501, 1930 (reference).

Raia isotrachys Garman, Mem. Mus. Comp. Zool., vol. 36, p. 354, 1913 (compiled).

Head to spiracle 5⅔ in total; disk length 1⅕ its width, slightly greater than tail. Snout 1⅙ in head to spiracle, not produced, would form slightly obtuse angle, slight notch either side near tip; eye 4½ in head to spiracle; 4¾ in snout, 2⅘ in interorbital; mouth slightly waved, width 2⅕ in preoral length from mouth corner; teeth subequal, bluntly pointed, upper about 35 rows; oronasal groove, internarial 2⅓ in space to snout tip and little greater than mouth width, hind valve large, with rather weakly developed fringes posteriorly; interorbital 2 in head to spiracle. Spiracles directly behind eye, oblique, little greater than eye.

Body and tail entirely covered above with small asperities, each with stellate base and spine at center; no spine on superciliary edge; on back near front end of vertebral column pair of larger spines, interspace equals interorbital; asperities about middle of interspace between spines larger than others; about 20 median spines in row on tail end at first dorsal; under surface smooth.

Dorsals subequal, about 3 in snout, interspace about ⅕ base of first; caudal rudimentary, 3½ in snout; pectorals form rhomboid disk, front edges slightly undulate, broad angle blunt and convex, hind edge broadly convex, likewise hind angle; ventrals deeply notched.

Above uniform purplish brown, narrowly edged much darker on posterior edge of disk. Hind ventral edges darker narrowly. Below whitish, edged with dark color on hind edge of disk and ventrals, corresponding with upper surface. Length 600 mm. (Tanaka.)

Japan.

RAJA TOBAE Tanaka

Raja tobae Tanaka, Dobuts. Zasshi, Tokyo, vol. 28, p. 313, 1916 (type locality: Miyazu).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 113, 1925 (Miyazu; Tokyo market; Toba market; Kagoshima Bay; Mikawa Bay).—Tanaka, Fishes of Japan, vol. 35, June 20, p. 673, 1927 (Kesen in Rikuzen); vol. 36, pl. 156, figs. 434–436, 1927.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 264, fig. 22, 1932 (Chefoo).—Wang, op. cit., vol. 9, No. 3, p. 104, 1933 (Chusan).

Raja meerdervoortii (not Bleeker) JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 337, 1900 (Tokyo).—PAVLENKO, Minutes Kazan Soc. Naturalists, vol. 42, p. 11, 1910 (Petri Magni Bay).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p 471 (Hakodate).—JORDAN, TANAKA, SNYDER, Journ. Coll. Sci. Tokyo, vol. 33, p. 26, fig. 1913 (Japan).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, No. 3, p. 3, 1928 (Fusan, Korea).

Raja meerdervoorti JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 650, fig. 7, 1903 (Tokyo, Nagasaki, Kobe, Wakanoura, Hakodate).—JORDAN and STARKS, Proc. U. S. Nat Mus., vol. 31, p. 515, 1906 (Port Arthur, Manchuria).

Raja meerdevoorti SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 460, 1906 (Kochi; Kagoshima).

Raia meerdervoortii ENGELHARDT, Abh. Bayer. Akad. Wiss., vol. 4, pt. 3, p. 102, 1913 (Munich Museum).

Head to spiracle 8⅔ in total length; disk length 1¼ in its width, 1⅗ in tail. Snout 1⅛ in head to spiracle, would form wide obtuse angle, with short point at tip; eye 3½, 2⅞ in snout, 1⅘ in interorbital; mouth slightly waved, width 1¾ in space between mouth corner and snout tip; teeth in 31 rows, subequal, bluntly pointed; oronasal groove present, anterior nasal valve tubular, posterior valve large, without or with weak fringes, internarial 1⅓ in distance to snout tip, subequal in length to mouth width; interorbital $1\frac{9}{10}$ in head to spiracle.

Body and tail above entirely covered with small asperities, each with stellate base and spine at center; no large spines on supraorbital; on back near front part of vertebral column 2 large spines each side, pair nearer median line larger; row of large vertebral spines from middle of back to dorsals of which 12 to 14 before vent and 25 to 29 posterior; 1 or 2 interdorsal spines; under surface smooth.

Dorsals small, first little larger or 2⅔ in head to spiracle, interdorsal ⅗ base of first; caudal low small fold; pectorals form rhomboid disk, front edge undulate, outer and hind angles broadly convex.

Uniform purplish brown, narrowly edged darker in hinder and inner margins. Hind ventral edge narrowly edged darker. Under surface whitish, hind edges of disk and ventrals broadly edged with dark dusky. Length, 282 mm. (Tanaka.)

Japan, Korea, Manchuria. Included by Taranetz as a synonym of *Raja kenojei.*

2 examples. A.N.S.P. Hakodate, Japan. Stanford University. Snout 1¼ in head; interorbital 3⅘ to 4; mouth width $2\frac{3}{7}$ to 2⅔; internasal $2\frac{3}{7}$ to 2⅗; preoral length 1⅒ to 1⅛; first dorsal length 3 to 4; front ventral edge 1¾; upper teeth 38 to 40, lower 37 or 38. Single median thorn on back. Preocular spines 2, postocular 1. Dusky pores or ducts of lorenzini below. Row of spines down tail above. Spine between dorsals. Lateral folds of tail well developed. No caudal fold. One with copepod parasite on upper surface of ventral. Both males.

RAJA KUJIENSIS Tanaka

Raja kujiensis TANAKA, Dobuts. Zasshi, Tokyo, vol. 28, p. 173, 1916 (type locality: Kuji, in Hitachi, northeast of Tokyo).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 109, 1925 (translation).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (compiled).

Disk rhomboid, wider than long inclusive of ventrals. Snout slightly pointed, tip forming angle of 140° length twice interorbital; teeth in 25 rows in jaws. Spiracle shorter than eye.

Body with uniformly scattered small spines, very few in small area behind spiracle, none on eye border only; large spines in single row from behind eye to second dorsal on midline of back; near disk center pair of rather large spines either side of line of middorsal spines; lower surface of disk entirely smooth.

Disk weakly crenulate in front edges, rounded at outer angle forming angle about 100°, hind disk angles rounded in angle about 90°.

Purplish brown, with few black spots, scattered irregularly and unsymmetrically in relation to middorsal white. Below dead white, with few dusky spots, margin dusky gray. Length, 825 mm. (Tanaka.)

Japan.

RAJA NASUTA Müller and Henle

Raja nasuta (Banks) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 150, 1841 (type locality: Australia, Ocean near Totaranni, New Zealand).—GRAY, List fish British Museum, p. 112, 1851 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 572, 1865 (copied).—HECTOR, Colonial Mus. Governm. Surv. Rept. (Fishes New Zealand), p. 84, 1872.—HUTTON, Trans. Proc. New Zealand Inst., vol. 8, p. 216, 1876 (Oamaru).—HECTOR, Handb. New Zealand, p. 16, 1879.—WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 18, pl. 19, pl. 21, fig. 2, 1909 (Chatham Islands, New Zealand, 9–105 fathoms).—RENDAHL, Vidensk. Medd. Dansk naturh. Foren. Kjöbenhavn, vol. 81, p. 1, 1925 (Napier).—YOUNG, Trans. New Zealand Inst., vol. 60, p. 140, 1929 (Chatham Islands).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

Raia nasuta GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 366, 1913 (New Zealand and Australia).

Raya oxyrhynchus (not Linnaeus) CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 224, 1872 (Victoria).

Raya rostrata (not Lacépède) CASTELNAU, Victoria Office Rec. Philadelphia Exhib. (Intercol. Exhib. Essays No. 5), p. 17, 1873 (Melbourne); Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 57, 1873 (on above).

Raja rostrata MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, pt. 2, p. 312, 1880 (Port Phillip); vol. 6, p. 376, 1881 (Port Phillip).

Raia scabra OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 17, 1888 [type locality: Manly, New South Wales; Port Phillip, Victoria (on *Raya rostrata* Castelnau)].

Raja scabra LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 46, 1890 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 11, 1927.

Depth 14⅘ to end of tail; head 3⅘; disk length 1⅙ in its width, tail less than disk. Snout 1⅔ in head, moderately long, produced in rather broad tip; eye 9, 6⅖ in snout, 3 in interorbital; dentary width 2⅘ in head; teeth in 44 rows in jaws, small, each with low cusp; nostrils small, front valve moderate, internarial equals dentary width; interorbital 3, depressed concavely. Gill openings small, subequal, equidistant. Spiracle slightly less than eye, deep, broad, edges entire.

Skin above rough to touch, asperities large on end of snout and rostral cartilages terminally, before each eye and in interorbital; 4 large tubercles along superciliary edge, besides smaller one outward and directly before eye; large occipital tubercle ends in sharp-pointed spine, followed by smaller one; from above ventrals row of strong vertebral tubercles, 24 to first dorsal and 2 more in interdorsal space; sides of tail roughly asperous.

First dorsal broad, length 5 in head; second dorsal 5½, similar; moreover the body appears much rougher.

New South Wales, Victoria, New Zealand.

U. S. N. M. No. 39667. New Zealand. Otago University. Length, 410 mm.

RAJA MURRAYI Günther

Raja murrayi GÜNTHER, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 15, pl. 5, 1880 (type locality: Kerguelen Island).

Raia murrayi GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 364, 1913 (compiled).

Head to first gill opening nearly 5 in total length; disk length 1⅓ its width, 2 in total length. Snout 1¾ in head, forms slightly obtuse angle with end somewhat projecting; eye 5, 2⅞ in snout, 2½ in interorbital; mouth width 2⅞ in head, but very slightly arched; teeth pointed in both sexes, more so in male than in female; nostrils rather large, internarial 3 in head, broad flap at each mouth corner with hind edge fringed; preoral length 1½ in head; interorbital 1$\frac{9}{10}$, cartilaginous firm region wide as orbit length. Spiracle large, oblique, close behind eye, slightly less than eye.

Curved spine in front and behind each orbit; 4 to 6 similar spines in triangle in middle of back; tail with median series of 16 to 18 spines, only very small ones on sides; these spines present in both sexes, young and old; in male greater part of body above smooth, with usual patch of recurved spines near pectoral angle; in female whole upper surface covered with scattered, small, stellate asperities, still more numerous in young; caudal series of spines in young usually continued forward to dorsal spines.

Dorsals close together, posterior little larger, 2⅞ in head, interdorsal narrow notch; pectorals form rhomboid disk, front edges undulate, outer and hind angles obtusely rounded; ventrals notched, hind section broad.

Above brown, with rounded darker and lighter ill-defined spots. Yellowish ocellus, little larger than orbit, edged with blackish, on each side of median line in male. Length, 445 mm. (Günther.)

Kerguelen Island. Only known from the types, 2 adults and 3 young, obtained by the *Challenger* Expedition.

RAJA PLUTONIA Garman

Raia plutonia GARMAN, Bull. Mus. Comp. Zool., vol. 8, p. 236, 1881 (type locality: Off South Carolina); Mem. Mus. Comp. Zool., vol. 36, p. 335, pl. 18, fig. 1, 1913 (lat. 31°57′ N., long. 78°18′35″ W., in 333 fathoms).—BARNARD, Ann. South African Mus., vol. 21, p. 68, 1925 (off Cape Point and south of Agulhas Bank, 450–560 fathoms).

Raia albalinea VONBONDE and SWART, Marine Biol. Surv. South Africa Rep., pt. 5, p. 6, pl. 20, fig. 1, 1923 (type locality: South Africa, in 280–600 fathoms).

Head to spiracle 8 in total length; disk width $1\frac{1}{10}$ in its length, which $1\frac{2}{5}$ in rest of body. Snout $1\frac{2}{5}$ in head to spiracle, angle broadly obtuse; eye 3 in head to spiracle, $2\frac{1}{5}$ in snout, 2 in interorbital; mouth slightly undulate, width little less than half preoral length; teeth in numerous rows, small, slightly spinose; outer nostril edges fringed, flaps over mouth corners slight and unfringed; interorbital $1\frac{1}{2}$ in head to spiracle, flat. Spiracle close behind eye, oblique, length $1\frac{1}{3}$ in eye.

Disk and sides of tail covered with spines; 2 spines before and 2 or 3 larger behind orbit; median series of large spines behind head extend on tail to first dorsal; each shoulder with group of 2 or 3 spines; no spines between dorsals; under surface smooth.

Second dorsal much larger than first, about 2 in snout, interdorsal narrow notch; caudal shorter than first dorsal; pectorals form subcircular disk, front margins slightly undulate, outer angles and hind margins very rounded and arclike.

Brown to light brown above, with irregular transverse white reticulations, on tail forming irregular white blotches. Under surface cream colored. Length, 165 mm. (Von Bonde and Swart.)

South Africa. Also off east coast of North America in the Atlantic. I follow Barnard in placing *Raia albalinea* with this species. He gives its length to 250 mm.

RAJA SIBOGAE Weber

Raja sibogae WEBER, *Siboga* Exped., vol. 57, Fische, p. 600, fig. 122, 1913 (type locality: Bali Sea, in 289 m.).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference).

Head to spiracle $6\frac{2}{3}$ in total length; disk length $1\frac{1}{5}$ in its width, $1\frac{2}{5}$ in tail. Snout to orbit $1\frac{2}{5}$ in head to spiracle, little exserted in broad triangular point; orbit 3⅓, 2⅓ in snout, 1⅞ in interorbital; middle of jaws arched, 36 rows of teeth above, and 28 below, conic; interorbital 1¼ in snout to orbit, concave. Spiracles little inclined, close behind orbit, half of orbit.

Upper surface of disk covered with small spines, absent above ventrals and each side of back posteriorly, also outer broad pectoral borders; row of larger thorns along each inner edge of orbit; row of 5 vertebral thorns medially over branchial region; at front of each pectoral band of large thorns, also oval group on outer posteromedian portion of each pectoral, all these areas nearly twice length of orbit; tail above with many irregular rows of thorns; entire lower surface smooth.

Dorsals and caudal continuous basally, former two separated by narrow notch, subequal, 1¾ in snout to orbit; caudal low fold but little over half dorsal; pectorals form rhomboidal disk, front edges undulate, outer and hind angles broadly convex.

Brown above, with indistinct, darker, rounded blotches. Under surface white. Length, 314 mm. (Weber.)

Bali Sea. Described from a male said to suggest *Raia andamanica* Lloyd, known from a female.

RAJA LINTEA Fries

Raja lintea Fries, Vet. Akad. Handl. Stockholm, 1838, p. 154 (type locality: Sweden).

Raia lintea Garman, Mem. Mus. Comp. Zool. vol. 36, p. 329, 1913 (northern Europe).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 72, 1925 (west coast off Cape Peninsula, in 200–300 fathoms).

Width only little greater than body length, equals space from snout end not quite to end of ventrals. Snout produced, pointed, tip acute, front margin slightly undulate; rostral cartilages united about half their length; eye less than interorbital, which 4 in snout; teeth in female in 60 rows with very small points; internasal twice distance of nostril from snout tip.

Upper surface with stellate-rooted asperities and small hooked spines over snout, front edges and hind parts of pectoral; groups of slightly larger spines in front of and behind orbits, on and before suprascapular region and in about 5 irregular rows down back, continued along tail to dorsal fin; sides of tail closely set with smaller spines; lower surface with minute asperities on snout.

Outer pectoral angle broadly rounded, hind edge convex.

Uniform brownish gray, light beneath. Length, 740 mm. (Barnard.)

West coast of South Africa. Also North Atlantic. Barnard's record on a single female.

RAJA BATIS Linnaeus

Raja batis LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 231, 1758 (type locality: European Ocean).—FOWLER, Proc. Acad. Nat Sci. Philadelphia, 1910, p. 471 (Italy).—NORMAN, *Discovery* Rep., vol. 12, p. 39, 1935 (off Cape Point, in 100 fathoms).

Raia batis GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 331, 1913 (coasts of Europe).—THOMPSON, Marine Biol. Rep. South Africa, No. 2, p. 156, 1914.—BARNARD, Ann. South African Mus., vol. 21, p. 70, pl. 4, fig. 3, 1925 (False Bay and off Cape Point, in 34 to 100 fathoms).

Dasybatis batis BONAPARTE, Cat. Metod. Pesci. Europei, p. 13, 1846 (Atlantic).

Raia machuelo OSBECK, Nova Act. Acad. Leopold. Carol., vol. 4, pp. 99, 104, 1770 (type locality: Spain).

Raja osbeckii WALBAUM, Artedi Pisc., vol. 3, p. 532, 1792 (on Osbeck).

Raja hispanica SCHNEIDER, Syst. Ichth. Bloch, p. 369, 1801 (on Osbeck).

Raia gaimardi VALENCIENNES, Voy. Island Groënland, *Gaimard*, Poiss., without text, pls. 2–3, 1847 (no type locality given).

Raja leiobatos GRAY, Cat. fish Gronow, p. 10, 1854 (type locality: Oceano Septentrionali).

? *Raia chinensis* BASILEWSKY, Nouv. Mém. Soc. Nat. Moscou, vol. 10, p. 251, 1855 (type locality: Oriental Sea, Pekin, China).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 356, 1913 (copied).

Raja chinensis FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference); Hong Kong Nat., vol. 1, p. 137, 1930 (compiled).

Snout 1⅓ in head; mouth width 2$\frac{1}{10}$; teeth above 48, below 45; preoral length 1⅖ in head; internarial 2¾; interorbital 4$\frac{1}{10}$.

Body largely smooth above; series of spines externally to pectoral tip to ventral; single small vertebral spine behind pharynx; series of median obsolete tail spines above; snout tip slightly rough above, below largely rough; body otherwise smooth.

Dorsals 2, well separated, first dorsal length 3 in head; no caudal; lateral tail folds well developed; front ventral edge 1⅓.

Pores to ducts of lorenzini dusky.

South Africa, also in the East Atlantic.

Raia machuelo Osbeck is noticed with oblong body, except caudal. Head rough, partly rounded, oval. Eyes oblong. Upper jaw long. Teeth acute, wide. Nostril large. Body finely rough. Pectorals form rhomboid disk. Brown above, white to pink white below. Length, 305 mm. or more.

The imperfectly noticed *Raia chinensis* Basilewsky is said to be near this species. The following are the few fragments of its description:

Snout long, pointed. Jaw teeth small, robust, smooth. Head rough above; under edge and ends of pectorals for outer third with pointed, curved spines; back with single obtuse scute. Caudal fleshy, partly compressed, with obtuse scutes anteriorly, acute behind; small dorsals; caudal small; at base ventrals fleshy, notched, shorter than disk. Gray above, white below. Length, 509 mm.

1 example. A.N.S.P. Italy. C. L. Bonaparte. Length, 390 mm.; width 250 mm.

RAJA NAEVUS Müller and Henle

Raja naevus Müller and Henle, Syst. Beschr. Plagiostomen, p. 138 (type locality: Atlantic coasts of Europe, Mediterranean Sea); p. 194, 1841 (note).

Raia naevus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 321, 1913 (Atlantic and Mediterranean coasts of Europe).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 72, 1925 (west coast, off Cape Peninsula and Saldanha Bay, 100–200 fathoms).

Width little greater than space from snout end to ends of ventrals. Snout somewhat obtuse, short, only slightly produced; rostral cartilages united about half their length; eye less than interorbital, which little over 3 in preocular length; teeth 54 with short points in male; internasal less than space from nostril to snout tip.

Upper surface with small asperities on snout, front pectoral edge, and sides of tail, more numerous and widely spread in young; spines on supraorbital ridge, 1 or 2 on suprascapula, median row from occiput to dorsal, flanked on hinder part of body and on tail in larger individuals by another row, sometimes by 2 rows on tail; lower surface smooth.

Pectorals with front edges undulate, outer angles broadly rounded, hind margin convex.

Brown, uniform or chiefly in young with numerous round dark spots, of which one near pectoral base usually more prominent and larger than others, surrounded by light ring. Under surface light, with usually some irregularly shaped, but more or less symmetrically arranged, dark blotches on pectorals and ventrals. Length to 700 mm. (Barnard.)

West coast of South Africa, Atlantic and Mediterranean coasts of Europe.

RAJA PHILIPI Lloyd

Raia philipi Lloyd, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 309, 1906 (type locality: Gulf of Aden, in 130 fathoms); Rec. Indian Mus., vol. 1, p. 5, 1907 (lat. 13°36′00″ N., long. 47°32′00″ E., in 130 fathoms, Arabian Sea); Illustr. Zool. *Investigator*, Fishes, pt. 9, pls. 40, 41, fig. 1, 1908; Mem. Indian Mus., vol. 2, p. 142, 1909 (type).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 353, 1913 (compiled).

Head to spiracle $5\frac{1}{3}$ in total; disk width $1\frac{1}{10}$ in its length, tail $1\frac{1}{5}$ in disk. Snout $1\frac{1}{4}$ in head to spiracle, slender, prominent; eye $6\frac{1}{5}$, 5 in snout, $2\frac{1}{4}$ in interorbital; mouth width $2\frac{1}{8}$ in head to spiracle, $1\frac{7}{8}$ in preoral length, which $1\frac{1}{8}$ in head to spiracle; mouth widely angular; teeth in 80 rows above, 60 below, low, triangular, on rhomboidal base; edges of nasal valves deeply fimbriated, united across middle line by distinct fold of skin which separated from upper jaw by deep curved groove, least width of internarial $2\frac{2}{5}$ in head to spiracle; interorbital $2\frac{3}{5}$, firm cartilaginous portion $4\frac{1}{5}$. Spiracle close behind eye, little oblique, subequal with eye.

Numerous small spinules on snout tip above and close to anterolateral disk edge in posterior half only; 4 thorns before and 3 behind eye; row of 5 median vertebral spines over branchial region; between ocellus and pectoral edge group of lanceolate denticles pointing inward; whole lower surface of snout covered with fine denticles; 3 somewhat irregular rows of spines on tail above and its sides spiny, below smooth.

Hind dorsal little larger, 2¾ in snout, interdorsal ⅞ first dorsal length; caudal small, low; pectorals form rhomboidal disk, front edges slightly undulate, lateral and hind angles broadly rounded.

Uniform brown above, with dark ocellus surrounded by paler ring at postero-median base of each pectoral. Uniform white below, tail dark mottled below. Length, 360 mm., male. (Lloyd.)

Gulf of Aden. Lloyd suggests *Raia powelli* may be the female; also a female from Travancore appears intermediate.

RAJA POWELLI Alcock

Raja powelli Alcock, Ann. Mag. Nat. Hist., ser. 7, vol. 2, p. 145, 1898 (type locality: Gulf of Martaban, Burma, in 67 fathoms); Illustr. Zool. *Investigator*, pt. 6, pl. 26, fig. 4, 1899; Cat. Deep Sea Fishes Indian Mus., p. 20, 1899 (type).

Raja powellii Annandale, Mem. Indian Mus., vol. 2, p. 16, 1909 (off Trivandrum, west coast of India).

Raia powelli Garman, Mem. Mus. Comp. Zool., vol. 36, p. 353, 1913 (copied).

Raiia powelli Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 352, 1929 (Travancore).

Head to spiracle 5⅔ in total length; disk length 1⅕ in its width, tail about 1⅕ in disk length. Snout 1⅕ in head to spiracle, rather slender, much exserted; eye 6¼, 5⅕ in snout, 3 in interorbital; mouth straight; teeth in 55 rows in either jaw in female, obtusely pointed or obscurely tricuspid; preoral length nearly half again as much as outer internarial; interorbital 2⅕ in head to spiracle, firm cartilaginous interspace 4. Spiracles large, close behind eye, oblique, equal orbit.

Disk surfaces smooth except prickles near snout edge, and edge of anterior half of pectoral fin; 2 or 3 spines on front edge of orbit, 1 behind orbit; row of 3 vertebral spines at nape; 2 or 3 rows of spines extend from hind fourth of disk to first dorsal, each side of tail thorny; short series of thorns in interdorsal.

Second dorsal little larger than first, 3¾ in head to spiracle, interdorsal 1½ in second dorsal; caudal small, low; pectorals form rhomboid disk, front edges broadly sinuous, outer and hind angles broadly rounded.

Above warm brown, with pair of large ocelli, one at each posteromedian part of pectoral base. Lower surface dirty white. Length, 318 mm. (Alcock.)

India.

RAJA OCULATA Risso

Raia oculata Risso, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 149, 1826 (type locality: Nice).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 319, 1913 (off southern England and France).—VonBonde and Swart, Marine Biol. Surv. South Africa Rep., pt. 3, 1922, p. 4, 1924 (compiled).

Raja maculata (not Shaw 1803) Montagu, Mem. Werner Soc., vol. 2, p. 426, 1811–1816 (type locality: "South coast of Devonshire").—Bonaparte, Cat. Metod. Pesci Europei, p. 13, 1846 (Atlantic, Mediterranean).

Raia maculata Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 71, 1925 (compiled).

Raia brachyura LaFont, Act. Soc. Linn. Bordeaux, vol. 28, p. 503, pl. 25, 1871 (type locality: "Des côtes de la Gironde").

Raja brachyura Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Mediterranean).

Raia blanda Holt and Calderwood, Trans. Roy. Dublin Soc., new ser., vol. 5, p. 395, 1895 (type locality: West coast of Ireland).

Raja montagui Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 468 (on *Raia maculata* Montagu).—Norman, *Discovery* Rep., vol. 12, p. 46, 1935 (note).

Depth 10½ to end of tail; head to first gill opening 5. Snout 1⅓ in head, tip slightly protruded and rounded; eye 8¾, 6⅓ in snout, 4 in interorbital; mouth width about 2 in head, apparently little curved; teeth in 88 rows above, about 86 below, each tooth with rather strong point; internasal 3⅕ in head; interorbital 2⅕, firm cartilaginous interorbital 4, deeply concave. Second and third gill openings longest, subequal with eye.

Upper surfaces all finely asperous; 4 small spines before each eye; median, vertebral series of dorsal spines, from close behind spiracles, most developed on tail; incomplete lateral row of few spines on each side of tail irregularly, of 10 spines on left side and 7 on right side; space above each ventral laterally on disk smooth; also front lobe of ventral; lower surface of disk largely smooth, broad medial area with scattered asperities, also under surface of tail more or less roughened.

First dorsal fin little shorter than second or 2¼ in snout; no caudal; tail 1½ in disk length; pectorals form rhomboid disk, slightly shorter than wide, with front edges undulate and hind edges slightly convex; front ventral lobe 1⅖ in snout.

Above dull brown, with numerous close-set, rounded, darker brown spots, all smaller than interspaces. Below uniformly pale.

South Africa. Also in the Atlantic and Mediterranean.

A.N.S.P. No. 17366. Mediterranean. C. L. Bonaparte. No. 76. Dr. T. B. Wilson. Length, 1,095 mm. Dried skin.

RAJA QUADRIMACULATA Risso

Raia quadrimaculata Risso, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 150, 1826 (type locality: Nice).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 323, 1913 (coasts of Europe and Madeira).—VonBonde and Swart, Marine

Biol. Surv. South Africa Rep., pt. 5, p. 5, 1924 (South Africa, 205 fathoms).—**Barnard**, Ann. South African Mus., vol. 21, pt. 1, p. 70, 1925 (west coast South Africa, Cape Peninsula, Saldanha Bay, 100–250 fathoms).

Raja quadrimaculata **Bonaparte**, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 3, descr., pl. fig. (2 males), 1833 (Italy); Cat. Metod. Pesci Europei, p. 14, 1846 (Mediterranean).—**Fowler**, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Bonaparte material).

Raja falsavela **Bonaparte**, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 26, descr., pl. fig. 1, 1836 (type locality: Italy).

Raia spinosa **Yarrell**, British fishes, ed. 2, vol. 2, p. 574, 1841 (type locality: North of Ireland; Dublin Bay).

Raja circularis **Malm**, Öfv. Vet.-Akad. Förh., Stockholm, 1857, p. 187 (Sweden).

Snout 1⅗ in head; mouth width 2⅒; upper teeth 40 to 43, below 42 or 43; preoral 1½; internarial 2½ to 2¾; interorbital 5⅓ to 6. Male with patch of recurved spines on head near disk margin opposite eyes. Smaller spines or asperities before and one behind, obsolete toward pectoral tips. On back medianly close behind eyes 2 spines, 3 before and 3 behind eye, and series of depressible ones on each pectoral externally. On back of tail traces of 3 series of spines.

First dorsal length 2⅘ to 2⅞ in head; front ventral edge 1⅗ to 1¾.

South Africa. Also East Atlantic.

2 examples, A. N. S. P. Italy. C. L. Bonaparte No. 221. Length, 330–518 mm., width 225–231 mm.

RAJA ANDAMANICA Lloyd

Raia andamanica **Lloyd**, Mem. Indian Mus., vol. 2, p. 140, 1909 (type locality: Andaman Sea, in 279 fathoms); Illustr. Zool. *Investigator*, Fishes, pl. 46, fig. 2, 1909 (type).—**Garman**, Mem. Mus. Comp. Zool., vol. 36, p. 352, 1913 (compiled).

Head to spiracle 6¼ in total; width 1⅙ its length which 1⅙ in rest of body. Snout 1⅕ in head to spiracle, projects very slightly, would form obtuse angle; eye 5 in head to spiracle, 3¾ in snout, 2⅓ in interorbital; mouth nearly transverse line, very slightly curved, ⅓ of snout; 54 rows of teeth above, 40 below, bases oval, front ones worn flat, back ones with low pointed cusp; front limit of nostril removed from mouth corner by space equal to mouth breadth; interorbital 2⅛ in head to spiracle. Spiracle close behind eye, diameter about half of eye.

About 15 large spines over rostral cartilage, not quite reaching end of disk; continuous row of 8 large thorns on supraorbital ridge, first before eye, last behind eye; single row of large spines in mid-dorsal line from short space behind spiracles to tail where less regular; rest of upper surface mostly, except posterolateral margins of pectorals, covered with small denticles; sides and top of tail spiny, spines larger on upper surface; entire lower surface smooth and naked, except terminal half of tail, which bears few very small spines.

Dorsals small, anterior somewhat larger than posterior (figure shows reverse), close to end of tail and separated by space less than base of either; caudal narrow fold of skin on lower side of tail; pectorals form rhomboidal disk, front edges undulate, lateral and hind angles evenly rounded.

Uniform slate gray above and below. Length, 210 mm. (Lloyd.)

Andaman Sea. Known only from the type in the Indian Museum.

RAJA LEOPARDUS Von Bonde and Swart

Raia leopardus Von Bonde and Swart, Marine Surv. South Africa Rep., pt. 5, p. 7, pl. 20, fig. 2, 1923 (type locality: Natal coast in 40–280 fathoms).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 74, 1925 (Natal coast).

Raja leopardus Norman, *Discovery* Rep., vol. 12, p. 35 (lat. 34°8′ S., long 17°33′ E., in 402?–548 m.), p. 44 (off Dassen Island, Table Bay, Cape Point; Natal; type), 1935.

Head to spiracle 7¼ to tip of tail; disk length 2⅕, length 1$\frac{1}{10}$ its width. Snout 1⅓ in head to spiracle, projects in rounded point forming obtuse angle; eye 5½ in head to spiracle, 4 in snout, 3 in interorbital; mouth nearly straight, with angle in middle toward snout, width 2 in preoral length, interorbital 1⅔ in head to spiracle, flat. Spiracles oblique, close behind orbit, long as eye.

Whole disk, excluding ventrals, covered with small spines, extending to end of tail, except median line which occupied by row of large vertebral spines from shoulder to first dorsal; small spines more densely strewn along front edges, rostrum, interorbital and sides of median line from head to tail; sparsely covered or almost smooth patches on either side of tail root and 2 areas anterior to suprascapular regions just behind head; also 2 before and 2 behind eye along orbital ridge; 2 suprascapular spines each side of disk center; no median spines between dorsals.

Dorsals and caudal continuous along shallow fold, subequal, about long as orbit; pectorals form subcircular disk, front margins slightly curved outward and slight concavities in margins either side of front end of rostrum, outer angles and hind edges and angles broadly rounded in wide curve; ventrals notched about half their length, oblong posteriorly and bluntly pointed either side of tail.

Dusky brown, with numerous distinct very dark brown, nearly black spots, varying in size from large, oval, oblong, and circular about size of eye on tail to smaller, more evenly circular and numerous spots on disk and along edges of margins; whole effect resembles appearance of leopard skin. With age color of background and spots fade, then dirty dusky yellow tinged with brown; spots less intense, far between, smaller and less well marked; tail well marked with smaller and larger spots; dorsals and caudal stained black, except hind free edges, which brown; lower surface unmarked and with ordinary pale yellow color. Length, 247 mm. (Von Bonde and Swart.) Natal.

RAJA NITIDA Günther

Raja nitida GÜNTHER, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 27, pl. 14, fig. a, 1880 (type locality: Off Twofold Bay, New South Wales, in 120 fathoms).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 9, p. 63, 1884 (Twofold Bay, in 120 fathoms).—MCCULLOCH, Zool. Res. *Endeavour*, vol. 1, p. 10, fig. 3 (mouth), 1911 (Bass Straits and Victoria); Fishes of New South Wales, ed. 2, p. 11, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

Raia nitida GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 363, 1913 (compiled).

Head to spiracle 5¾ in total length; disk length 1$\frac{1}{10}$ in its width, tail about 1⅓ in disk length. Snout 1⅓ in head to spiracle, tip very thin median papillary projection, forms broadly obtuse angle; eye 3¼ in head, 2⅓ in snout, 1⅔ in interorbital; teeth with very small points, nearly obtuse; internarial between outer nostril edges less than their distance from snout tip; interorbital 2¼ in head to spiracle, firm cartilaginous interspace less than orbit. Spiracle close behind eye, 1⅓ in eye.

All upper parts covered with minute asperities; 1 or 2 curved spines in front and behind orbit; 1 in middle of back and series along median line of tail to dorsals.

Dorsals close together, interspace nearly ⅖ base of first which larger or 3⅕ in head to spiracle; pectorals form rounded disk, front edge very slightly undulate, outer and hind edges and angles rather evenly to obtusely convex; ventral deeply notched, broad behind.

Above light brown, marbled with dark brown, dark brown blotches ornamented by small, round, yellowish ocelli. Length, 204 mm. (Günther.) Victoria, New South Wales.

RAJA POROSA Günther

Raja porosa GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 154, 1874 (type locality: Chefoo).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Mokpo, Korea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference); Hong Kong Nat., vol. 1, p. 135, 1930 (compiled).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 266, fig. 23, 1932 (Chusan).—WANG, Contrib. Biol. Lab. Sci. Soc. China, vol. 9, p. 104, 1933 (Chusan).—IKEDA, Hakubutugaku Zassi, vol. 35, p. 582, 1927 (Momotori-Mura).

Raia porosa GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 350, 1913 (China).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 160, pl. 5, fig. 15, 1932 (tooth) (Tsingtao).

? *Dasybatis undulata* (not Lacépède) BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 120, 1874 (Chinese drawing).

Front part of snout abruptly contracted into narrow thin appendage; disk width much more than distance from snout end to hind margin of ventral fin. Teeth in 54 or 56 series above, pointed in male, flat in female; interorbital more than ⅓ in snout.

Superciliary margin with a series of spines; rostral process with small stellate asperities; series of 3 or 4 spines in median line of back behind head; tail with 3 series of spines in male, 5 in female. Male with band of hooks near pectoral angle and again on each side of head and front disk edge covered with asperities on upper side in whole length. Female smooth on parts just noted, but provided with broad band of small hooks along upper side of posterior margin.

Pectorals forming anterior profile undulated.

Upper parts brown, snout white. Lower parts whitish, tinged with brown. Skin of lower part of snout and throat perforated with numerous large pores, white in center and surrounded by black ring. Width, 110 mm. (Günther.)

Northern Chefoo. Günther's description based on a male and a female.

RAJA SPINACIDERMIS Barnard

Raia spinacidermis Barnard, Ann. South African Mus., vol. 13, pt. 8, p. 440, 1923 (type locality: South Africa); vol. 21, pt. 1, p. 73, pl. 4, fig. 6, 1925 (South Africa, probably off Cape Point in deep water).

Raja spinacidermis Norman, *Discovery* Rep., vol. 12, p. 46, 1935 (type).

Head to spiracle 4⁹⁄₁₀ in total length; disk length 1⅓ in its width, tail 1⅖ in disk length. Snout 1¼ in head to spiracle, pointed but little produced, rostral cartilages narrow and slender, united little over half their length; eye 6, 4⅞ in snout, 2⅖ in interorbital; teeth in 60 rows, median ones slightly pointed; internarial less than distance of nostril from snout tip; interorbital 2⅖ in head to spiracle, firm cartilaginous interspace 4. Spiracles little oblique, close behind eye.

Whole upper surface of disk and upper and lateral surfaces of tail covered with closely set fine, setiform spinules, resembling skin of *Spinax*, larger and closer on tail than elsewhere; large spines entirely absent; lower surface of snout tip with few spinelets; lower surface of tail, except median line of basal ⅔, with setiform spinules similar to those on upper surface.

Dorsals small, separated, about 4 in head to spiracle; pectorals form rhomboid disk, front edge nearly straight, outer angle broadly rounded, hind edge convex.

Pale slaty gray, becomes slightly darker toward inner margins of pectorals, distinctly darker on ventrals. Lower surface similarly and as deeply colored as upper surface. Reaches 600 mm. (Barnard.)

South Africa. Known only from a female, possibly a sexual variation of *Raja microps* Günther, which Barnard considers it.

The following species of the North Pacific are listed here for completeness:

RAJA ALEUTICA Gilbert

Raja aleutica Gilbert, Rep. U. S. Fish Comm., pt. 11 (1893), p. 397, pl. 21, 1895 (type locality: Station 3257, north of Sannak Pass, Aleutian Islands, depth 81 fathoms).—Jordan and Evermann, U. S. Nat. Mus. Bull. 47, pt. 1, p. 75, 1896 (Unalaska).—Evermann and Goldsborough, Bull. Bur. Fisheries, vol. 26 (1906), p. 230, 1907 (Alaska).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 22, 1930 (Far East Seas).

Raia aleutica Garman, Mem. Mus. Comp. Zool., vol. 36, p. 343, 1913 (off Aleutian Islands).

Localities: Kamchatka, Aleutians, Alaska.

RAJA BINOCULATA Girard

Raja binoculata Girard, Proc. Acad. Nat. Sci. Philadelphia, 1854, p. 196 (type locality: San Francisco).—Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 878, 1883 (compiled).—Jordan and Evermann, U. S. Nat. Mus. Bull. 47, pt. 1, p. 72, 1896 (Monterey to Sitka).—Schmidt, Fishes western seas Russia, p. 291, 1904 (Korsakowsk at Saghalin).—Evermann and Goldsborough, Bull. Bur. Fisheries, vol. 26 (1906), p. 229, 1907 (Alaska localities).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 470 (Pacific Grove, Calif.).—Berg, Faune Russie, Poiss., vol. 1, p. 90, 1911 (Korsakowsk).—Jordan, Tanaka, and Snyder, Journ. College Sci. Tokyo, vol. 33, p. 28, 1913 (reference).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1920, p. 400 (California materials); 1923, p. 279 (Vancouver, British Columbia; Seattle, Wash.), p. 283 (San Francisco), p. 295 (La Jolla, Calif.).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 19, 1930 (Far East Seas).

Raia binoculata Bean, Proc. U. S. Nat. Mus., vol. 4, p. 260, 1882 (Sitka; Port Althorp; St. Paul; Kadiak).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 346, 1913 (California northward).

Uraptera binoculata Girard, Rep. Pacific R. R. Surv., Fish, pt. 10, p. 373, 1858 (San Francisco; Presidio, Calif.).

Raja cooperi Girard, op. cit., p. 372 (type locality: Sand flats near the entrance of Shoalwater Bay).—Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 42, 1883 (Monterey to Sitka).

Snout $1\frac{2}{7}$ to $1\frac{1}{4}$ in head; interorbital 4 to $4\frac{3}{4}$; mouth width $2\frac{2}{7}$ to $2\frac{3}{5}$; internasal $2\frac{3}{4}$ to $2\frac{7}{8}$; snout tip to mandible $1\frac{1}{6}$ to $1\frac{2}{7}$; first dorsal length $3\frac{1}{8}$ to $4\frac{1}{2}$; front ventral edge $1\frac{5}{6}$ to $2\frac{1}{10}$; teeth above 40 to 44, below 36 to 43; eye socket $1\frac{1}{2}$ to $1\frac{3}{4}$ in interorbital.

In male disk widest slightly after middle in its length, front profiles well undulated, and snout tip not extremely tapering. Interorbital concave. Eye shorter than spiracle. Mouth little curved. Teeth acute. Body smooth above, except minute asperities on rostral cartilages, preocular, vertebral column just after pharynx and opposite ventral bases, and along front pectoral margins and lower snout surface. Median series of spines on back begins over hind basal region of ventral. About 4 small spines above eyes and 2 above left spiracle. Series of depressible spines externally on each pectoral. Color in alcohol dull chocolate brown above. Several obscure dusky blotches at each pectoral base. Below whitish, ducts of lorenzini ending in dusky pores. Narrow lateral cutaneous fold along tail. Dorsals 2, separated, second continuous basally with caudal fold.

Female with disk widest well after middle of its length, front profiles scarcely undulated. Snout pointed. Mouth straight. Teeth rather acute. Minute asperities similar to but smaller than in male, more numerous on head posteriorly, over greater pectoral area and lower region of back. No depressible pectoral spines. On back just after pharynx 2 vertebral spines. Over eye 4 spines, none over spiracle. An obscure lateral series of spines, besides enlarged median series.

Saghalin, Korsakowsk, Alaska, British Columbia, Washington, Oregon, California. Description above from specimens from Pacific Grove, Calif., in A. N. S. P.

RAJA INTERRUPTA Gill and Townsend

Raia interrupta GILL and TOWNSEND, Proc. Biol. Soc. Washington, vol. 11, p. 232, 1897 (type locality: Bering Sea).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 345, 1913 (copied).

Raja interrupta JORDAN and EVERMANN, U. S. Nat. Mus., Bull. 47, pt. 3, p. 2751, 1898 (compiled).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 22, 1930 (Far East Seas).

Localities: Far East Seas, Bering Sea.

RAJA PARMIFERA Bean

Raia parmifera BEAN, Proc. U. S. Nat. Mus., vol. 4, p. 157, 1882 (type locality: Iliuliuk, Unalaska).—JORDAN and GILBERT, U. S. Nat. Mus. Bull. 16, p. 878, 1883 (copied).—GARMAN, Mem. Mus. Comp. Zool. vol. 36, p. 345, 1913 (Unalaska).

Raja parmifera GILBERT, Rep. U. S. Fish Comm., pt. 19 (1893), p. 395, 1895 (Bristol Bay, Alaska).—JORDAN and EVERMANN, U. S. Nat. Mus., Bull. 47 pt. 1, p. 74, 1896 (copied).—EVERMANN and GOLDSBOROUGH, Bull. Bur. Fisher., vol. 26 (1906), p. 230, 1907 (Frederick Sound; Shelikof Strait; Chignik Bay; Alitak Bay, Alaska).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 21, 1930 (Far East Seas).—TARANETZ, Bull. Associate Acad. Sci. S. S. S. R., No. 13, pp. 90, 91, 1935 (note); Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 51, 1937.

Localities: Far East Seas, Alaska.

RAJA ROSISPINIS Gill and Townsend

Raia rosispinis GILL and TOWNSEND, Proc. Biol. Soc. Washington, vol. 11, p. 231, 1897 (type locality: Bering Sea.)—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 345, 1913 (copied).

Raja rosispinis Jordan and Evermann, U. S. Nat. Mus. Bull. 47, pt. 3, p. 2751, 1898 (copied).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 22, 1930 (Far East Seas).—Taranetz, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 51, 1937.

Raia obtusa Gill and Townsend, Proc. Biol. Soc. Washington, vol. 11, p. 231, 1897 (type locality: Bering Sea).

Localities: Far East Seas, Bering Sea.

RAJA VIOLACEA Suvorov

Raja violacea Suvorov, Bull. Acad. Sci. Leningrad, vol. 3, p. 433, fig. 1, 1935 (type locality: Okhatsk Sea).—Taranetz, Bull. Associate Acad. Sci. S. S. S. R., No. 13, pp. 90, 99, 1935 ("Described on two specimens probably belonging to different species"); Bull. Pac. Sci. Inst. Fisher. Oceanogr., vol. 2, p. 50, 1937.

Locality: Okhotsk Sea.

Genus PSAMMOBATIS Günther

Psammobatis Günther, Cat. Fishes British Mus., vol. 8, p. 470, 1870. (Type, *Psammobatis rudis* Günther, monotypic.) (*Psammobates* Fitzinger 1835 in reptiles not involved.)

Malacorhina Garman, Proc. Boston Soc. Nat. Hist., vol. 19, 1877, p. 203, 1878. (Type, *Raja mira* Garman, monotypic.)

Irolita Whitley, Rec. Australian Mus., vol. 18, p. 97, 1931. (Type, *Raja waitii* McCulloch, orthotypic.)

Disk circular. Tail depressed, with fold on each side. Snout very short, overlapped by front portions of pectoral fins, which form foremost part of disk. Teeth obtuse. Each nostril with 2 nasal valves, anterior forming sort of tube, posterior triangular. Two small dorsals near end of tail, latter without distinct terminal fin. Each ventral divided by deep notch, front part narrow and enveloped in very loose skin.

PSAMMOBATIS WAITII (McCulloch)

Raja waitii McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 12, pl. 3, text fig. 4 (ventral view), 1911 (type locality: Northwest of Greenly Island, South Australia, in 44 fathoms).—Fowler, Proc. 4th (1929) Pacific Sci. Congr. Java, p. 500, 1930 (reference).

Psammobatis waitii Waite, Rec. South Australian Mus., vol. 2, p. 30, fig. 43, 1921.

Irolita waitii Whitley, Rec. Australian Mus., vol. 18, p. 97, 1931 (reference).

Head to first gill opening 4¾ in total length; disk length $1\frac{1}{10}$ in its width, tail 1½ in disk length. Snout 1⅖ in head to spiracle, broadly rounded, with median rounded papilla; eye 4⅔, 3¾ in snout, 3⅕ in interorbital; mouth width 2½ in head to first gill opening; teeth small, rounded, scarcely juxtaposed, each with small median point; nostrils with raised tubular margin, forming lobe posteriorly; nasal lobes extended back and out, outer edges truncate, posterior sinuate, internarial 2⅗ in head to first gill opening; preoral length 1⅚; interorbital 1⅞ in head to spiracle. Gill openings gradually smaller to posterior, first rather more than half width of spiracle. Spiracle oblique, equals eye.

Disk smooth above except 2 pairs of spines above front part of eyes and 4 over posterior portions; several minute spines on upper eyelid; tail with several rows of spines, largest anteriorly, most numerous posteriorly; both dorsals covered with minute spines.

Dorsals subequal, interspace about half base length, first dorsal 3 in head to spiracle; no caudal; pectorals form circular disk, edges all rounded; front ventral lobes well extended.

Pale brown above with lighter patches covered with small brown dots. Body, fins, and tail with numerous small bluish spots, absent only on lighter patches of disk. In places bluish spots confluent and form reticulations. Lower surfaces slate colored. Length, 454 mm. (McCulloch.)

South Australia, Southwest Australia.

Family DASYATIDAE

Body, head, and pectorals depressed, forming wide disk. Tail distinct from disk, narrow and tapering, usually with serrated spine. Mouth transverse, more or less curved. Teeth small, in quincunx, tessellated. Front nasal valves confluent across narrow isthmus, reaching mouth. Gill openings narrow. Spiracles large, close behind eyes. Front copula of hypobranchial cartilages segmented. Skin smooth or rough with spines or tubercles, or both. Pectorals meet in front of cranium, forming snout without supporting rostral cartilages. Ventrals small, below pectorals.

A large family with many species, living mostly in the seas and rivers of subtropical or tropical countries. They are generally found in bays, lagoons, or inlets in shallow water. As they conceal their bodies by burying in the mud or sand leaving only their eyes and spiracles free, they are a scourge to the unwary bather or fisherman, for should one be trodden on it immediately darts its murderous caudal spine into the foot or leg of its victim, inflicting painful or even mortal wounds. Sting rays are said to fling their tails around fishes they attack for food, piercing or tearing at them with the deadly caudal spine, much the same as they would try to defend themselves from a powerful enemy.

ANALYSIS OF GENERA

a^1. Dasyatinae. Disk about wide as long.
  b^1. Tail long and whiplike.
    c^1. Tail with serrated spine.
      d^1. Disk oval; tail compressed ---------------------------------- **Taeniura**
      d^2. Disk quadrangular; tail filamentary ------------------------ **Dasyatis**
    c^2. Tail without serrated spine; disk circular ---------------- **Urogymnus**

b^2. Tail moderate or short.
  e^1. Caudal fin present.
    f^1. Tail with serrated spine................................ Urolophus
    f^2. Tail without serrated spine.......................... Anacanthobatis
  e^2. No caudal fin.. Urolophoides
a^2. Gymnurinae. Disk broader than long; tail short.................. Gymnura

Genus TAENIURA Müller and Henle

Taeniura Müller and Henle, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 117. (Atypic: Type, *Trygon ornatum* Gray); Arch. Naturg., 1837, p. 400. (Type, *Trygon ornatum* Gray, virtually orthotypic.)

Trygon (not Cuvier) Geoffroy Saint-Hilaire, Descr. Egypte, Poiss., pl. 25, 1817. (Type, *Raja lymma* Forskål, monotypic.)

Alexandrinum Molin, Sitz. Ber. Akad. Wiss. Wien., math.-nat. Kl., vol. 42, p. 579, 1861 (Atypic: Type, *Alexandrinum molini* Zigno).—Zigno, Reale Inst. Veneto, vol. 8, p. 299, 1874. (Type, *Alexandrinum molini* Zigno=*Raja muricata* Volta, 1796.)

Discotrygon Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 468. (Type, *Discobatis marginipinnis* Maclay and Macleay, orthotypic.)

Taeniurops Garman, Mem. Mus. Comp. Zool., vol. 36, p. 399, 1913. (Type, *Taeniura meyeni* Müller and Henle.)

Disk rounded. Tail longer than body, with spine above, in front of middle of length. No rostral cartilage. Mouth small, with papillae, velum fringed. Teeth small, tessellate, grooved transversely. Front nasal valves confluent, with free lateral and hind edges, median attachment narrow. Cranium prominent, fontanel broad and rounded in front of skull, narrow between orbits. No dorsal. Subcaudal rayless below terminal end of tail. Pectorals meet in front of skull. Ventrals elongate, front rays longer than posterior.

The following species, insufficiently described, appears to approach *Taeniura meyeni:*

TAENIURA GRABATA (Geoffroy Saint-Hilaire)

Trygon grabatus Geoffroy Saint-Hilaire, Descr. Egypte, Poiss., vol. 1, p. 218, pl. 25, figs. 1–2, 1809; p. 232, 1827 (type locality: Red Sea).

Trygon grabata Günther, Cat. Fishes British Mus., vol. 8, p. 484, 1870 (copied).

Taeniura grabata Müller and Henle, Syst. Beschr. Plagiostomen, p. 172, 1841 (Alexandria).—Gray, List fish British Museum, p. 125, 1851 (copied).

Taeniura grabatus Duméril, Hist. Nat. Elasmobr., vol. 1, p. 621, 1865 (compiled).

Head to hind spiracle edge $5\frac{1}{5}$ in total length. Snout $1\frac{2}{5}$ in head to hind spiracle edge, front edge as seen above broadly convex; eye 13, 9 in snout, $5\frac{3}{4}$ in interorbital; interorbital $2\frac{1}{4}$ in head to hind spiracle edge. Spiracle large, close behind eye, 3 times long as eye and interspiracle space $2\frac{1}{10}$ in head.

Skin smooth, except few asperites along side of tail before caudal spine and back to its tip (shown on figure).

Tail 1⅗ in disk length, with caudal fold beginning under caudal spine insertion and extending to tail tip; caudal spine 2 in head to hind spiracle edge; pectorals form circular disk, which slightly broader than long; ventrals obtuse, extend little below hind disk edge.

Above uniform. (Geoffroy Saint-Hilaire.)

Günther says "upper surface covered with minute spines with a radiated base." According to Duméril reddish gray above, white below. Disk 1,117 mm., tail 865 mm.

ANALYSIS OF SPECIES

a^1. Mouth curved; 2 oral papillae; skin smooth in young, medianly little rough with age; grayish, with rounded, dark-edged blue or black spots__ **lymma**

a^2. Mouth straight; 5 oral papillae; skin smooth; blackish brown____ **meyeni**

TAENIURA LYMMA (Forskål)

Raja lymma Forskål, Descript. Animal., pp. VIII, IX, 1775 (type locality: (Lohaja, Red Sea).—Gmelin, Syst. Nat. Linn., vol. 1, p. 1511, 1789 (Red Sea).—Walbaum, Artedi Pisc., vol. 3, p. 533, 1792 (copied).—Lacépède, Hist. Nat. Poiss., vol. 1, p. 119, pl. 4, figs. 2–3, 1798 ("isles de Praslin, Cayenne, Asie, Afrique, Amérique").

Raia lymnia Bonnaterre, Tableau encyclop., Ichth., p. 5, 1788 (Red Sea).

Raja lymna Schneider, Syst. Ichth. Bloch, p. 365, 1801 (Red Sea).

Raia lymna Cuvier, Régne animal, vol. 2, p. 137, 1817 (reference).

Trygon lymma Geoffroy Saint-Hilaire, Descr. Egypte, Poiss., pl. 27, fig. 1, 1818 (Red Sea).

Trygon lymna Cloquet, Dict. Sci. Nat., vol. 38, p. 62, 1825.

Trigon lymna Rüppell, Atlas Reise nördl. Afrika, Fische, p. 51, pl. 13, fig. 1, 1828 (Red Sea); Neue Wirbelth., Fische, p. 69, pl. 19, fig. 4, 1835 (reference).

Taeniura lymma Müller and Henle, Syst. Beschr. Plagiostomen, p. 171, pl. 55, fig. 3, 1841 (India, Red Sea, Timor, New Ireland).—Gray, List fish British Mus., p. 124, 1851 (Red Sea, Singapore).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 78, 1852 (Batavia, Singapore); Nat. Tijdschr. Nederland. Indië, vol. 3, p. (54) 85 (Singapore, Batavia), p. 546, 1852 (Amboina); Verh. Batav. Genootsch. (Plagiost.), vol. 25, p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 7, p. 228, 1854 (Macassar); vol. 12, p. 194 (Ternate), p. 218, 1856 (Nias); Act. Soc. Sci. Indo-Néerl., vol. 1, No. 3, p. 6, 1856 (Manado); vol. 1, No. 5, p. 8, 1856 (Amboina); vol. 2, No. 7, p. 9, 1857 (Amboina); Nat. Tijdschr. Nederland. Indië, vol. 13, p. 389, 1857 (Timor, Koepang); vol. 15, p. 243, 1858 (Singapore); Nederland. Tijdschr. Dierk., vol. 1, p. 160, 1863 (Morotail, Halmahera).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 619, 1865 (Red Sea, types of *Trygon halgani*).—Martens, Verh. zool.-bot. Ges. Wien, vol. 16, p. 379, 1866 (Red Sea).—Günther, Fishes of Zanzibar, p. 143, 1866 (Aden, Zanzibar, Mozambique); Cat. Fishes British Mus., vol. 8, p. 483, 1870 (Red Sea, Zanzibar, Singapore, East Indies, Ceram).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 241, 1871 (Red Sea).—Günther, *in* Brenchley's Cruise of *Curaçoa*, p. 409, 1873 (Solomon Islands).—Schmeltz, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Kandavu).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Singapore).—Schmeltz, Cat. Mus. Godeffroy, No. 7, p. 64, 1879 (Kandavu).—Károli, Termesz. Füzetek, Budapest, vol. 5, p. 148, 1881 (Singapore; Sarawak).—

MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 598, 1883 (New Guinea).—OGILBY, Proc. Linn. Soc. New South Wales, vol. 10, p. 465, 1885 (Cape York); Cat. Fishes Australian Mus., pt. 1, p. 20, 1888 (South East New Guinea).—FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang).—SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 241, 1907 (Padang).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 473 (Padang example).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 495, 1910 (New Mecklenberg, Solomons, Admiralty Islands).—OGILBY, Mem. Queensland Mus., vol. 1, p. 21, 1912 (Darnley Island).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 399, pl. 53, fig. 4, pl. 55, fig. 7, pl. 71, figs. 4–5, 1913 (Red Sea, Singapore, Mauritius, Fiji).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 604, 1913 (Saleyer).—OGILBY, Mem. Queensland Mus., vol. 5, p. 87, 1916 (Green Island, Cairns, Cape York, Darnley Island).—MCCULLOCH, Rec. Australian Mus., vol. 13, pt. 2, p. 41, pl. 10, 1920 (Murray Island, Port Douglas and St. Crispin Reef, Queensland).—WHITLEY, Australian Zoologist, vol. 4, p. 228, 1926 (North West Islet, Cape York and Sir Edward Pellew Islands, Queensland).—PARADICE and WHITLEY, Mem. Queensland Mus., vol. 9, p. 78, 1927 (Pellew Group).—BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 1015, 1927.—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (Port Moresby); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (Siam, East Indies, Indian Ocean); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).—HERRE, Fishes Herre Philippine Exped. 1931, p. 13, 1934 (Sitanki; Jolo).—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, No. 63, p. 12, 1935–36 (Red Sea).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 16, 1937 (reference).—FOWLER, List Fish. Malaya, p. 18, 1938 (reference).

Taeniura lymna CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1412, 1849 (Pinang, Malay Peninsula, Singapore).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 60, p. 571, 1870 (Singapore).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (East Indies).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—CHABANAUD, Service Océanogr. Peches Indo-Chine, 1^e note, p. 6, 1926 (Gulf of Siam).—GILTAY, Mem. Mus. Roy. Nat. Hist. Belg., ser. 5, vol. 3, p. 16, 1933 (Poeloe Endoe, Aru Islands).—SUVATTI, Index Fish. Siam, p. 5, 1937 (Nam Chieu, Trat).

Taeniura lijmma BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 740, 1852 (Macassar).

Trygon ornatus GRAY, Illustr. Indian Zool. Hardwicke, vol. 1, pl. 99, 1832 (type locality: Singapore). (*ornatum* in list of figures.)

Trygon halgani LESSON, Voy. *Coquille*, Zool., vol. 2, pt. 1, p. 100, pl. 3, 1830 (type locality: Offack Bay, Waigiu; Port Praslin, New Ireland).—GUÉRIN, Iconogr. Poiss., pl. 69, fig. 3, 1838.

Trygon halganii SCHMELTZ, Cat. Mus. Godeffroy, No. 4, p. 29, 1869 (Kandavu).

Taeniura lymnia halgani WHITLEY, Rec. Australian Mus., vol. 18, No. 3, p. 97, pl. 11, 1931 (Murray Island, Whitsunday Passage, North West Islet, Brampton Island, St. Crispin Reef, Cape York, Port Darwin, Pellew Group).

Taeniura melanospilos BLEEKER, Nat. Tijds. Nederland. Indië, vol. 4, p. 513, 1853 (type locality: Batavia, Java).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 620, 1865 (compiled).—SOUTHWELL, Rep. Ceylon Marine Lab., vol. 1, p. 185, 1910 (Ceylon pearl banks); Ceylon Administr. Rep., 1912–13, pp. E43, E49.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Taeniura melanospila GÜNTHER, Cat. Fish. British Mus., vol. 8, p. 484, 1870 (compiled).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 682, 1871 (Red Sea).—DAY, Fishes of India, pt. 4, p. 740, 1878 (off Coromandel).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 49, 1885 (North Celebes and Macassar).—DAY, Fauna British India, Fishes, vol. 1, p. 56, 1889.—BOULENGER, Proc. Zool. Soc. London, 1892, p. 136 (Muscat).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 400, 1913 (copied).

Discobatis marginipinnis MACLAY and MACLEAY, Proc. Linn. Soc. New South Wales, vol. 10, p. 676, pl. 46, figs. 7–15, 1886 (type locality: Pacific Ocean near Admiralty Islands; on specimen with mutilated tail from Sorry or Wild Island).

Discotrygon marginipinnis FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 462 (on Maclay and Macleay).

Depth 13 to 13½ to end of tail; head 6; disk width 1$\frac{1}{10}$ to 1⅛ in its length, which 1⅙ in tail. Snout 1⅓ to 1½ in head, front profile as seen from above convex; eye 5 to 5¼, 3½ in snout, 3¼ to 3½ in interorbital; dentary width 3⅓ to 3⅞ in head, 1¼ in internarial width; teeth in 15 to 24 rows in jaws, convex, rhombic; nostrils simple deep pits, edges entire; interorbital 1⅔ to 2⅖ in head, depressed medianly, each eye bulging little upward. Gill openings moderate, equidistant, last smallest. Spiracles large, deep, larger than eye, edges entire.

Skin smooth in young, variably larger examples roughened with some fine asperities near middle of disk. On trunk median row of small vertebral tubercles. Tail with 1 to 2 spines in large examples of which posterior longer or about long as snout.

No dorsal; anal as wide fold inferiorly on tail, its depth greater than tail depth; pectorals form subcircular disk, outer edges broadly convex; ventrals partly triangular elongate, ends in rather wide points.

Back gray-brown, disk paler marginally and including pectorals and ventrals, marked with small dark blue or slate blue spots, largest on head medially and about pectoral bases but becoming numerous and smaller as if crowded about outer portions of disk. With age spots greatly more numerous, especially submarginal small ones. None of spots extend on tail, which has blue superolateral longitudinal line each side. Under surface of body whitish. Anal dusky marginally, brownish basally.

Red Sea, Arabia, Zanzibar, Mozambique, Mauritius, Malay Peninsula, Singapore, East Indies, Philippines, Siam, Queensland, Melanesia, Polynesia. A handsome species easily known by its ornate coloration. Garman describes the body as smooth, though with age my examples show some roughness.

8432. Cebu market. March 24, 1909. Length, 440 mm.
5187. Jolo market. March 7, 1908. Length, 360 mm. to end of broken tail.
A1412. Tampotana Island. December 31, 1909. Length, 472 mm.

7669. Ulugan Bay, Palawan Island. December 28, 1908. Length, 500 mm.

U.S.N.M. No. 47611. Red Sea. Glen Island New York Museum. Length, 280 mm.

U.S.N.M. No. 49326. Massaua, Red Sea. Milan Museum. Length, 345 mm.

U.S.N.M. No. 58008. Zamboanga. Dr. E. A. Mearns. Length, 725 mm. Tail cut in half, with 2 spines.

U.S.N.M. No. 39975. Port Moresby, New Guinea. Australian Museum. Length, 585 mm..

1 example. A.N.S.P. Padang, Sumatra. A. C. Harrison and H. M. Hiller. Length, 405 mm. In arrack pale olivaceous brown above, darker or dusky down disk center and tail above. Disk above marked everywhere with large deep ultramarine blue spots varying up to eye in size and irregularly distributed. Tail above with 2 longitudinal narrow blue bands along each side from junction with disk till opposite lower caudal lobe base. Disk edges above somewhat soiled buff brown. Disk below white, edges or borders similar to those above, same also of ventrals. Tail dirty white below. Lower caudal lobe blackish.

TAENIURA MEYENI Müller and Henle

Taeniura meyeni MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 172, pl. 1841 (type locality: Mauritius).—GRAY, List fish British Museum, p. 124, 1851 (Cape Upstart, Queensland).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 620, 1865 (type).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 483, 1870 (copied).—SAUVAGE, Hist. Nat. Madagascar, Poiss., pp. 5, 510, 1891.—PEARSON, Ceylon Administr. Rep., p. E13, 1912-13.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 400, 1913 (Mauritius).—WHITLEY, Rec. Australian Mus., vol. 18, p. 99, 1931 (reference).

Head to hind spiracle edge 6⅖ to caudal tip. Snout 1⅖ in head to hind spiracle edge; eye 4¾, eye 4⅗ in snout, 2⅘ in interorbital; mouth straight, width 1½ in internarial or 2⅙ in preoral length; about 28 lower rows of teeth each with transverse groove; interorbital 1¾ in head to hind spiracle edge. Spiracle close behind and slightly less than eye, interspiracle space 1⅔ in head to hind spiracle edge.

Skin smooth.

Tail with low keel above near end; subcaudal extends over great part of tail terminally, equally deep medially as terminally; pectorals form nearly circular disk, which little broader than long, subequal with tail.

Blackish brown above. Below white, pectorals and ventrals with blackish edges. (Müller and Henle.)

Mauritius, Ceylon. According to Duméril the type is 480 mm. long.

Genus DASYATIS Rafinesque

Dasyatis RAFINESQUE, Caratteri animali piante Sicilia, p. 16, 1810. (Type, *Dasyatis ujo* Rafinesque, monotypic.)

Dasybatus (Klein) WALBAUM, Artedi Pisc., vol. 3, p. 581, 1792. [Atypic; type, *Raja pastinaca* Linnaeus, designated by Jordan, Proc. U. S. Nat. Mus., vol. 4, p. 35, 1881 (inadmissible).]

Dasibatis Agassiz, Nomencl. Zool. Pisces, p. 21, 1845.—(Garman) Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 65, 1883. (Type, *Raja pastinaca* Linnaeus.)

Uroxis Rafinesque, Indice d'ittiologia siciliana, p. 48, 1810. (Type, *Dasyatis ujo* Rafinesque, virtual monotype.)

Trygonobatus Blainville, Bull. Soc. Philom. Paris, vol. 8, p. 112, 1816. (Type, *Trygonobatus vulgaris* Blainville=*Raja pastinaca* Linnaeus, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 94, 1917.)

Trygonobatis Blainville, Faune Française, Poiss., p. 35, 1825. (Type, *Raja pastinaca* Linnaeus.)

Trygon (Adanson) Cuvier, Règne animal, vol. 2, p. 136, 1817. (Type, *Raja pastinaca* Linnaeus, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 98, 1917.

Pastinachus Rüppell, Atlas Reise nördl. Afrika, Fische, p. 82, 1828. (Type, *Raja sephen* Forskål.)

Pastinaca Swainson, Nat. Hist. Animals, Fishes, vol. 1, p. 172, 1838. (Type, *Raja sephen* Forskål.)

Pastinacha Swainson, Nat. Hist. Animals, Fishes, vol. 2, pp. 192, 319, 1839. (Type, *Pastinacha olivacea* Swainson=*Raja pastinaca* Linnaeus, virtually tautotypic.)

Himantura Müller and Henle, Arch. Naturg., p. 400. 1837. (Atypic; type, *Raja uarnak* Forskål, designated by Garman, Mem. Mus. Comp. Zool., vol. 36, p. 375, 1913.)

Himanturus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 375 (392), 1913. (Type, *Raja uarnak* Forskål.)

Hypolophus Müller and Henle, Arch Naturg., p. 400, 1837. (Atypic; type, *Raja sephen* Forskål, selected as example by Bonaparte, Ann. Sci. Nat., Bologna, vol. 2, p. 202, 1838.)

Hemitrygon Müller and Henle, Mag. Nat. Hist., vol. 2, p. 90, 1838. (Type, *Trygon bennetti* Müller and Henle, monotypic.)

Heliobatis Marsh, Amer. Journ. Sci. Arts, ser. 3, vol. 14, p. 256, 1877. (Type, *Heliobatis radians* Marsh, monotypic.) (Fossil.)

Xiphotrygon Cope, Amer. Nat., vol. 13, p. 333, 1879. (Type, *Xiphotrygon acutidens* Cope, monotypic.)

Brachioptera Gratzianow, Zool. Anz., 1906, p. 400. (Type, *Brachioptera rhinoceros* Gratzianow, monotypic.)

Pteroplatytrygon Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, 474. (Type, *Trygon violaceum* Bonaparte, orthotypic.)

Amphotistius Garman, Mem. Mus. Comp. Zool., vol. 36, p. 375 (392), 1913. (Type, *Trygon sabina* Lesueur, orthotypic.)

Toshia Whitley, Rec. Australian Mus., vol. 19, No. 1, p. 60, 1933. (Type, *Dasyatis fluviorum* Ogilby, orthotypic.)

Bathytoshia Whitley, *op. cit.*, p. 61. (Type, *Dasyatis thetidis* Whitley, orthotypic.)

Disk partly quadrangular to partly circular. Tail elongate, whiplike, with serrated caudal spine, with or without dermal fin folds behind spine and without lateral folds on base. No rostral cartilages supporting snout. Front copula of branchihyal cartilages segmented. Skin smooth or with spines and tubercles. No rayed dorsal fins. Pectorals wanting in front of skull.

The following species is known only from the original imperfect figure of Müller and Henle:

DASYATIS PURPUREUS (Müller and Henle)

Trygon purpurea (Andrew Smith) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 160, pl. 52, 1841 [no locality (probably South Africa, on drawing by Sir Andrew Smith.)]—GÜNTHER, Cat. Fishes British Museum, vol. 8, p. 472, 1870 (reference).

Trygon (Himantura) purpureus DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 593, 1865 (compiled).

Dasybatis purpurea BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 78, 1925 (on original figure of Müller and Henle).

Dasybatus purpurea BARNARD, Ann. Mag. Nat. Hist., ser. 10, vol. 13, p. 229, 1934 (Kalk Bay; False Bay, South Africa).

Head very small, 13¾ in total length. Snout 2 in head to hind spiracle edge, as seen above forms widely obtuse angle; eye very small, 5 in head, 2 in snout, 2½ in interorbital; mouth width large; preoral length 1½ in mouth width; about 26 rows of upper teeth; internarial slightly greater than preoral length or 1⅓ in mouth width, edge of each flap entire; interorbital 1⅔ in head to hind spiracle edge. Spiracle small, close behind eye, slightly larger than eye, interspiracle width 2⅕ in head.

Skin smooth.

Tail little shorter than disk length, tapering, spine (one figure shows 2 spines) midway in tail length, 5½ in disk length; pectorals form broad rhomboid disk, front edges but very slightly sinuous, outer angles convex; ventrals obtusely rounded.

Above dark blue to violet, below somewhat clearer blue. Size not given, length of larger figure 285 mm. (Müller and Henle.)

ANALYSIS OF SPECIES

a^1. HIMANTURA. Tail without keels or folds; disk broader than long; tubercles depressed in pavement.
  b^1. Tail 3 times body or more.
    c^1. Oral papillae 4 to 7.
      d^1. Brown, with dark spots, tail banded---------------------- uarnak
      d^2. Brown, with lighter spots, tail banded-------------------- gerrardi
    c^2. Oral papillae 2; brown, tail without bands------------------- bleekeri
  b^2. Tail twice length of body or more.
      e^1. Oral papillae 7; reddish-brown spots, more or less reticulate. krempfi
      c^2. Oral papillae 4; brown, with paler spots, snout pointed---- alcockii
      e^3. Oral papillae 2; brown, with yellow reticulations---------- favus
a^2. PASTINACHUS. Cutaneous fold on tail below, none above; disk broader than long; tubercles rounded, stellate.
      f^1. Tail 3 times disk length; snout sharp; oral papillae 5; scales tessellated; brown------------------------------------ bennettii
      f^2. Tail more than twice to nearly 3 times disk length.
        g^1. Oral papillae 5.
          h^1. Brown, uniform or irregularly spotted white---------- latus
          h^2. Brown, tail blackish-------------------------------- sephen
        g^2. Oral papillae 4; brown, tail blackish------------------ gruveli

f^3. Tail 1⅓ times disk length; oral papillae 9; bluish slate. **agulhensis**

f^4. Tail once disk length.

i^1. Oral papillae 5; 7 median spines on back; greenish-slate above-- **schreineri**

i^2. Oral papillae 3; spines stellate; slate gray, spotted with white------------------------------------ **brevicaudatus**

a^3. DASYATIS. A cutaneous fold below tail, keel above; disk broader than long; oral papillae 5; body smooth; tail 1½ body lengths; brown, greenish to olive or grayish, with or without pale spots------------------ **pastinacus**

a^4. AMPHOTISTIUS. A cutaneous fold below tail and another above; disk broader than long.

j^1. No larger tubercles in vertebral row----------- **sinensis**

j^2. Tubercles in vertebral row narrow, depressed.

k^1. Tail little over 2 disk lengths.

l^1. Back rough, with median row of tubercles; oral papillae 7; brown, olivaceous--------------- **fluviorum**

l^2. Body smooth, only tail roughened terminally; oral papillae 7; gray, with irregular blackish margins. **ushiei**

k^2. Tail equals 2 disk lengths.

m^1. Oral papillae 3; median row of tubercles; above chocolate brown--------------------- **navarrae**

m^2. Oral papillae 2; brown, with black-edged blue spots------------------------------------ **kuhlii**

k^3. Tail less than 2 disk lengths.

n^1. Oral papillae 5; back smooth to rough, tubercles broad based in vertebral and scapular rows; brown olive to grayish---------------- **brevis**

n^2. Oral papillae 3; back roughened, tubercles vertebral and humeral; brown, uniform to clouded. **akajei**

n^3. No oral papillae; back smooth to rough, tubercles in median row large; brown, yellowish to reddish------------------------------------ **zugei**

k^4. Tail once or more length of body.

o^1. Oral papillae 5; tubercles with stellate bases; white, tail gray brown------------- **microps**

o^2. Oral papillae 4.

p^1. Olive, tail gray; snout pointed; tubercles rounded------------------------- **jenkinsii**

p^2. Coloration uniform------------- **ponapensis**

o^3. Oral papillae 3------------------- **uylenburgi**

o^4. Oral papillae 2.

q^1. Gray with blackish margins- **marginatus**

q^2. Reddish brown, yellow spotted. **imbricatus**

q^3. Brown, with 9 ill-defined, crescentic, brownish markings arched along middle of each pectoral------------ **granulatus**

Subgenus HIMANTURA Müller and Henle

DASYATIS UARNAK (Forskål)

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Raja arnak FORSKÅL, Descript. Animal., p. IX, 1775 (Lohaja; Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1512, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 536, 1792 (copied).—SCHNEIDER, Syst. Ichth. Bloch, p. 364, 1801 (Red Sea).

Raia uarnac CUVIER, Règne animal, vol. 2, p. 136, 1817 (reference).

Trygon uarnak MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 158, 1841 (Indian Ocean and Red Sea).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1405, 1849 (Pinang, Malay Peninsula, Singapore).—GRAY, List fish British Museum, p. 116, 1851 (Red Sea; Madras).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 69, 1852 (Batavia); (Bengal), vol. 25, p. 16 (on *Trygon russellii* Gray), p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 8, p. 393, 1855 (Amboina); vol. 21, p. 58, 1860 (Cape of Good Hope).—BLYTH, Journ. Asiat. Soc. Bengal, vol. 29, p. 44, 1860 (Calcutta).—DAY, Fishes of Malabar, p. 277, 1865.—BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 276, 1868 (Batjan).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 473, 1870 (Red Sea, Zanzibar, Seychelles, Madras, Pinang, India, East Indies).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 679, 1871 (Red Sea).—PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p. 853 (New Ireland).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 407, 1876 (Bangkok).—DAY, Fishes of India, pt. 4, p. 737, pl. 194, fig. 1, 1878.—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 2, p. 366, 1878 (Port Darwin); vol. 5, p. 313, 1880 (Port Darwin); vol. 6, p. 377, 1881 (Port Darwin); vol. 8, p. 212, 1883 (Lower Burdekin River, Queensland).—BOULENGER, Proc. Zool. Soc. London, 1887, p. 667 (Muscat).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 19, 1888 (Burdekin River, Marysborough, Port Essington; Malabar).—DAY, Fauna British India, Fishes, vol. 1, p. 53, 1889.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Buntal).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 193, 1904 ("Sungai Batu"?, Banda, Maharami).—STEINDACHNER, Denkschr. Akad. Wiss. Wien. math.-nat. Kl., vol. 71, pt. 1, p. 160, 1907 (Scheich Othman and Kor Garrich).—VOLZ, Nat. Tijdschr. Nederland, Indië, vol. 66, p. 240, 1907 (Palembang).—LLOYD, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 22, fig. 2, pl. 1, figs. 1–2, pl. 2, figs. 1–1a, pl. 3, fig. 2, 1909 (Bengal Bay).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 402, 1910 (Samoa).—PELLEGRIN, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 4, 1912 (Singapore).—ZWAAN, Durch Zentral-Sumatra, vol. 2, p. —, 1912 (Taluk, Sumatra).—PEARSON, Ceylon Administr. Rep. 1912–13, p. E 13.—SOUTHWELL, Ceylon Administr. Rep. 1912–13, pp. E 43, E 44.—ZUGMAYER, Abh. Bayer. Akad. Wiss., math. phys. Kl., vol. 26, p. 8, 1913 (Oman).—WEBER, *Siboga* Exped., vol. 57, Fische, p. 602, 1913 (Tamal Djampeah, Makassar, Saleyer).—PEARSON, Ceylon Administr. Rep., 1914, p. E 4; 1915–18, p. F 12.—BAMBER, Journ. Linn. Soc. London, vol. 31, Zool., p. 478, 1915 (Sudanese Red Sea).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 3, p. 287, 1916 (reference).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 77, 175, 1929 (Cochin China).

Trygon uarnack RICHARDSON, Ichth. China Japan, p. 197, 1846 (Sea of China, Indian Ocean, Red Sea, Cape of Good Hope).

Trygon (Himantura) uarnak DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 585, 1865 (Red Sea, Malabar, Seychelles, Tourane, Cochinchina, Dorey, New Guinea).

Trygon uarnak WEBER, Zool. Ergebn. Reise Niederländ. Ost Indien, p. 458, 1894 (Borneo, Banka, Java, Ternate, in fresh water).

Pastinachus uarnak RÜPPELL, Neue Wirbelth., Fische, p. 69, pl. 19, fig. 2, 1835.

Leiobatus uarnak BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 264, 1863 (Atapupu, Timor).

Himantura uarnak SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27 (1907), p. 235, 1908 (Manila).—OGILBY, Mem. Queensland Mus., vol. 5, p. 88, 1916 (Moreton Bay, Platypus Bay, Pine Peak, Burdekin River, Goode Island).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, July 7, p. 130, 1925 (reference).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 12, fig. 38 a, 1927.—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 17, 1937 (reference).

Himantura arnak McCULLOCH, Austral. Mus. Mem., vol. 5, p. 29, 1929 (North Australia; Queensland; New South Wales).

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Dasyatis uarnak STEAD, Additions to fish fauna New South Wales, vol. 1, p. 2, 1907 (Queensland).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 473 (Padang); vol. 79, p. 256, 1927 (Orani and Orion, Philippines); Mem. Bishop Mus., vol. 10, p. 24, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (East Indies, Philippines); Hong Kong Nat., vol. 1, p. 177, fig. 20, 1930 (East Indies, Philippines).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 109, fig. 9, 1933 (Yenting).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 364, 1935 (Durban); List Fish. Malaya, p. 17, 1938 (reference).

Dasyatis uaranak FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 101, 1928 (Bombay; also Philippine and Sumatran examples) (error).

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Raja ommescherit FORSKÅL, Descript. Animal., p. VIII, 1775 (type locality: Red Sea).

Raja tajara FORSKÅL, Descript. Animal., p. VIII, 1775 (type locality: Red Sea).

Raja schoukie FORSKÅL, Descript. Animal., p. VIII, 1775 (type locality: Red Sea).

Raja mula FORSKÅL, Descript. Animal., p. VIII, 1775 (type locality: Red Sea).

Raja uarnata WALBAUM, Artedi Pisc., vol. 3, p. 713, 1792 (on Forskål).

Raja tafara WALBAUM, Artedi Pisc., vol. 3, p. 713, 1792 (on Forskål).

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Trygonobatus russellii Gray, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 100, 1832–34 (type locality: India).

Trygon russellii Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 42, 1860 (Calcutta).

Dasyatis russellii Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang examples).

Trygon variegatus McClelland, Calcutta Journ. Nat. Hist., vol. 1, p. 60, pl. 2, fig. 2, 1841 (type locality: Salt lake, near Calcutta).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 24 (on McClelland), p. 82, 1853 (reference).—Blyth, Journ. Asiatic Soc. Bengal. vol. 29, p. 43, 1860 (Calcutta).

Trygon (Himantura) variegatus Duméril, Hist. Nat. Elasmobr., vol. 1, p. 587, 1865 (copied).

Trygon undulata Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 70, 1852 (type locality: Batavia, Samarang); Nat. Tijdschr. Nederland. Indië, vol. 8, p. (152) 167, 1855 (Bandjermassing, Batavia, Samarang).

Trygon (Himantura) undulatus Duméril, Hist. Nat. Elasmobr., vol. 1, p. 586, 1865 (Malabar).

Trygon maculata (Kuhl and Van Hasselt) Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 70, 1852 (name in synonymy).

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Trygon semirugosa (Kuhl and Van Hasselt) Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 71, 1852 (name in synonymy).

Trygon uarnacoides Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 72, 1852 (type locality: Batavia, Samarang); Nat. Tijdschr. Nederland. Indië, vol. 3, p. (717) 738, 1852 (Pankalpinang, Banka; Java); vol. 7, p. 314, 1854 (Bantem); Act. Soc. Sci. Indo-Néerl., vol. 2, No. 7, p. 9, 1857 (Amboina); Nederland. Tijdschr. Dierk., vol. 1, p. 73, 1863 (Banka).—Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 588, 1912 (Batavia).

Trygon acuta (Kuhl and Van Hasselt) Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 72, 1852 (name in synonymy).

Trygon pastinacoides Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 75, 1852 (type locality: Batavia).—Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 588, 1912 (Batavia).

Trygon ellioti Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 41, 1860 (type locality: Lower Bengal).

Trygon punctata Günther, Cat. Fishes British Mus., vol. 8, p. 474, 1870 (type locality: East Indian Archipelago ?).—Bartlett, Sarawak Gaz., vol. 26, No. 366, p. 134, 1896 (Buntal).

Trygon (Himantura) oxyrhynchus Sauvage, Bull. Soc. Philom. Paris, ser. 7, vol. 2, p. 94, 1878 (type locality: Saigon, Cochinchina).

Himantura gerrardi (not Gray) Tosh, Marine Biol. Rep. Queensland, p. 4, pl. 5, fig. 2, 1903 (Goode Island).

Depth 16⅗ to 23¾ to end of tail; head 6 to 10⅕; disk about long as wide, its length 1⅗ to 2⅗ in tail. Snout 1⅓ to 1⅔ in head, forms short median point of blunt wide angle; eye 5½ to 8 in head, 4 to 5⅓ in snout, 2¾ to 4⅞ in interorbital; dentary width 3⅗ to 4 in head, waved; teeth in 25 to 38 rows in jaws; nostrils simple pits, internasal little broader than dentary width; interorbital 1½ to 2⅕ in head, nearly level. Gill openings moderate, equidistant, last smallest. Spiracle large, deep, little larger than eye, edges entire.

Skin largely smooth. Spine 1⅞ in interspiracle. A few fine asperities on occiput. Large median white tubercle in center of disk, surrounded by many smaller close-set flattened ones in form of rhomb.

Dorsal and anal absent; tail very long and tapering; pectorals form broad rhomboid disk, hind edges very slightly convex; ventrals triangular, rather pointed; claspers short points.

Back and upper surface of disk dark brown, below whitish. Tail dusky.

Red Sea, Arabia, Zanzibar, Natal, Cape of Good Hope, Madagascar, Seychelles, India, Ceylon, Malay Peninsula, Pinang, Singapore, East Indies, Siam, Cochinchina, Philippines, Northern Territory Australia, Queensland, Melanesia, Polynesia. With age the middle of the back becomes studded more or less with tubercles, finally extending more or less over the head, body and tail. Garman says "the vertebral series apparently does not extend upon the tail" which is true also of my large examples as well as the small ones.

9053. Aboyog, Leyte. July 26, 1909. Length, 1,260 mm. Covered all over above with very numerous close-set dark brown spots, crowded closely, though smaller toward edges of disk.

7635. Mouth of Melampaya River. December 26, 1908. Length, 1,445 mm. Covered entirely with thick-set dark spots.

8293. Sorsogon market, Luzon. March 12, 1909. Length, 1,027 mm. Body above with small close-set dark obscure spots.

5087. Sandakan, Borneo, Dutch East Indies. March 2, 1908. Length, 675 mm. Marked with creamy spots above though larger and most conspicuous posteriorly on disk.

5109. Sandakan. March 3, 1908. Length, 910 mm.

7187. Port San Vicente. November 18, 1908. This agrees in coloration and armature with the Melampaya River specimen. Caudal spines 2, posterior 1½ in head.

6324. Manila market. July 11, 1908. Length, 1,490 mm.

6754. Manila market. April 20, 1909. Length, 1,690 mm. This and the preceding differ a little, though as both are males possibly sexual. Both have in addition to the large median tubercle at the center of the disk 11 or 12 forward and 4 or 5 posteriorly vertebral tubercles, all smaller. These also have a more pointed snout than the others of large size and the dark spots are much more indistinct or less defined, also apparently less numerous.

U.S.N.M. No. 39983. Maryborough, Queensland. Australian Museum. Length, 1,250 mm. Body marked with close-set pale spots, intervening dark lines forming reticulations.

U.S.N.M. No. 39985. Port Essington. Australian Museum. Length, 1,040 mm.

U.S.N.M. No. 72481. Batavia, Java. Bryant and Palmer. April 2, 1909. Length, 178 mm. As *Trygon pastinacoides.* Disk entirely smooth; caudal spine 1¾ in head or little greater than interspiracle width.

U.S.N.M. No. 72482. Batavia, Java. Bryant and Palmer. Length, 508 mm. As *Trygon uarnacoides.*

2 examples A.N.S.P. Padang, Sumatra. A. C. Harrison and H. L. Hiller. Disk 196 to 225 mm. Brown above, darker in disk center and on disk posteriorly number of round whitish spots with darker brown borders than body color. Tail basally with similar spots and most entire length with many equal whitish rings. Below white, tinted pale brown along edges.

DASYATIS GERRARDI (Gray)

Trygon gerrardi GRAY, List fish British Mus., p. 116, 1851 (type locality: India).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 474, 1870 (types: East Indies: Japan).—ELERA, Cat. Fauna Filip., vol. 1, p. 620, 1895 (Luzon, Cavite, Santa Cruz).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 240, 1907 (Priaman, Padang, Benkulen).

Trygon gerrardii ANNANDALE, Mem. Indian Mus., vol. 2, p. 24, pl. 2, fig. 2, pl. 3, fig. 6 (mouth), 1909 (Burma, Chittagonge, Orissa).

Leiobatis gerrardi BLEEKER, Arch. Néerland. Sci. Nat., vol. 13, p. 36, 1878 (New Guinea).

Himantura gerrardi JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 42, 1901 ("Japan").

Dasybatus gerrardi GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 377, 1913 (India, East Indies, Samoa, Zanzibar).

Dasyatis gerrardi FOWLER, Mem. Bishop Mus., vol. 10, p. 24, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java., p. 504, 1930 (reference); List Fish. Malaya, p. 16, 1938 (reference).

Trygon macrurus BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 607, 1852 (type locality: Padang, Batavia, Samarang); Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 74, 1852 (Batavia, Samarang, Padang); Act. Soc. Sci. Ind.-Néerl. (Sumatra), vol. 8, p. 11, 1860 (Priaman); Nat. Tijdschr. Nederland. Indië, vol. 20, pp. 239, 447, 1859–60 (Singapore); Nederland. Tijdschr. Dierk., vol. 1, p. 73, 1863 (Banka).

Trygon liocephalus KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 678, 1871 (type locality: Koseir, Red Sea).

Himantura fai JORDAN and SEALE, Bull. Bur. Fisher., vol. 25 (1905), p. 184, fig. 2, 1906 (type locality: Apia, Samoa).

Trygon uarnak (part) GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 492, 1910 (on Jordan and Seale).

Head to hind spiracle edge 11½ in total length. Snout 1½ in head to hind spiracle edge, seen above meets at widely obtuse angle, not projecting; orbit 5, 3⅓ in snout, 3¼ in interorbital; mouth width 1¾ in snout; teeth in about 13 upper rows, 23 below; interorbital 1½ in head. Spiracle close behind eye, subequal.

Seven small spines, close-set vertebral row over last half of branchial area above center of disk; few scattered minute asperities scarcely showing through skin near vertebral spines and on interorbital, otherwise disk entirely smooth. Upper surface of tail with scattered small asperities.

Tail long, whiplike, without any folds (spine removed); disk subquadrangular, length 1⅕ in its width or 2⁹⁄₁₀ in tail, front edges slightly sinuous, outer angles broadly rounded, hind edges convex with ends obtuse.

Above drab brown, uniform, top of tail dusky. Under surface of disk uniform white and under surface of tail light brown.

Red Sea, Zanzibar, India, East Indies, Japan, Polynesia. Also reported from the Philippines by Elera. According to Garman possibly a variety of *Dasyatis uarnak*.

U.S.N.M. No. 51712. Apia, Samoa. Bureau of Fisheries. Length, 1,195 mm. Type of *Himantura fai.*

DASYATIS BLEEKERI (Blyth)

Trygon bleekeri BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 41, 1860 (type locality: Bengal).—DUMÉRIL. Hist. Nat. Elasmobr., vol. 1, p. 593, 1865 (copied). —GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 475, 1870 (copied).—DAY, Fishes of India, pt. 4, p. 738, pl. 195, fig. 3, 1878; Fauna British India, Fishes, vol. 1, p. 54, 1889.—ANNANDALE, Mem. Indian Mus., vol. 2, p. 26, pl. 3, fig. 9 (mouth), 1909 (off Burma and Orissa).—PEARSON, Ceylon Administr. Rep., 1915–18, p. F14.—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 173, 1923 (Nontaburi); Mem. Roy. Asiatic Soc. Bengal, vol. 6, p. 464, 1924 (Tale Sap, Outer Lake).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6e Note, p. 175, 1929 (Cochin China).—SUVATTI, Index Fish. Siam, p. 5, 1937 (reference).

Dasybatus bleekeri GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 379, 1913 (compiled).—SUVATTI, Index Fish. Siam, p. 6, 1937 (Ko Yai; Kwae Yai).

Dasybatus (*Himanturus*) *bleekeri* CHEVEY, Inst. Océanogr. Indochine, 19e Note, p. 7, 1932 (Cochin China).

Head to hind spiracle edge 8⅗ in total length. Snout 1¼ in head to hind spiracle edge; eye 8¾, 6¼ in snout, 4⅖ in interorbital; jaws distinctly undulated, upper medially forms narrow conical downward projection, lower with corresponding median concavity; teeth dark reddish brown, with single transverse ridge, very distinct on unworn teeth and divides as 2 equal convex surfaces marked with longitudinal corrugations; on mouth floor 2 long fingerlike processes nearer one another than either to mouth angle but rather widely separated; interorbital 2¼ in head to hind spiracle edge. Spiracles close behind and little larger than eyes, interspace 2.

Large round tubercle in middle of back, commonly 3 smaller disposed before and 3 similarly behind. Tubercles sometimes along upper tail surface to caudal spine, with age extend to its extremity.

Tail long, whiplike, spine about first eighth of its length or 2⅞ in head to hind spiracle edge; pectorals form subrhomboidal disk, length 2⅓ in tail, width 1$\frac{1}{10}$ in its length, front edges slightly sinuous and hind and outer angles broadly rounded.

Above uniform dark brown. Ventral surface in young white, with broad dark-brown margin, with age broadens over most of disk; sometimes leaving distinct median streak which may be obscured by dark blotches or disappear. (Day, Annandale.)

India, Ceylon, Cochin China. Known by its uniform coloration above, the tail without pale rings. Blyth reported one 2,465 mm.

long. According to Garman "apparently one of the numerous varieties of *D. uarnak.*"

DASYATIS KREMPFI Chabanaud

Dasybatus (*Himanturus*) *krempfi* CHABANAUD, Bull. Mus. Hist. Nat. Paris, 1923, p. 47, text fig. 2 (buccal papillae) (type locality: Pnom Penh, Cambodia); Service Océanogr. Pêches. Indo-Chine, 1e Note, p. 6, 1926 (reference).

Dasybatus krempfi CHABANAUD, Bull. Mus. Hist. Nat. Paris, 1923, p. 558 (Pnom Penh).

Dasyatis krempfi FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Snout short, sharp point on front disk edge; eye somewhat prominent, nearly large as spiracle; mouth feebly incurved, upper jaw with 3 undulations; lower less so; teeth small, white, in oblique rows, with transverse keel faced behind well-marked concavity; 2 series of oral papillae, 4 in front equidistant and 3 behind; interocular width 2¾ in snout from eye.

Skin with small polygonal scutes or more or less rounded, sparse upon snout and disk above, more numerous upon head and median region; somewhat behind center of back large rounded pearl-like scute, followed by smaller; more posteriorly series of spiniform scutes, prolonged upon tail nearly ⅔ its length, which considerably more remote than insertion of caudal spines.

Tail 2½ to 3 times longer than disk, armed with 2 short spines marked each side with 2 feeble grooves, below 2 other grooves deeper and approaching each other so convex space separated resembles an elevated keel; these 4 indistinct grooves at tail base well marked medianly in their length and nearly to their extremity, appearing to form above and below rudimentary cutaneous fold; pectorals form subcircular disk, somewhat longer than broad, front edges partly linear, outer angles rounded and hind angles narrowly rounded; ventrals subtriangular, outer angle moderately prolonged.

Above very pale, with reddish-brown spots, irregularly rounded, often confluent, paler in centers, compact so pale coloration gives aspect of network. Rest of tail and all body below white. Length, 655 mm. (Chabanaud.)

Indochina. Said to be near *Dasyatis imbricatus* though its coloration suggesting *Dasyatis favus.*

DASYATIS ALCOCKII (Annandale)

Trygon alcockii ANNANDALE, Mem. Indian Mus., vol. 2, p. 27, fig. 3, 1909 (type locality: Puri, Orissa coast).

Dasybatus alcockii GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 378, 1913 (copied.)

Head to hind spiracle edge ⅓ in total length. Snout 1¼ in head to hind spiracle edge, as seen above pointed, forming right angle;

eye small, 9¾ in head, 7¼ in snout, 5 in interorbital; mouth small, jaw distinctly but not strongly undulated; teeth white, with single distinct transverse ridge, larger on upper jaw at sides than in middle, not occupying whole exposed surface of either jaw; interorbital 2 in head to hind spiracle edge. Spiracles little larger than eye and farther apart or interspace 1⅘.

Skin tough. Scales flat, more or less rounded; largest in small patch behind shoulder girdle; between eyes and on middle of hind part of back and base of tail larger than those on central part of disk, where small and deeply sunk in skin to almost invisible; tail completely covered with flat scales except ventral surface of part anterior to spine, this surface, pectoral and pelvic fins bare.

Tail nearly cylindrical but somewhat flattened above base, tapering, without cutaneous folds, with single spine equal to space across interspiracle; pectorals form quadrangular disk, its length 1⅔ in tail, 1⅙ in its width, outer angles rounded.

Above dark olive-brown, with small, obscure, pale spots scattered all over disk and base of tail. Fin edges purplish above. Dorsal and lateral surfaces of tail brown, without markings except at base. Ventral surface, including base of tail, white suffused with pink. Rather broad purplish lateral margin marbled with white. Length, about 1,983 mm. (Annandale.)

DASYATIS FAVUS (Annandale)

Trygon favus ANNANDALE, Mem. Indian Mus., vol. 2, p. 25, pl. 1, fig. 3, pl. 3, fig. 10 (mouth), 1909 (type locality: Off Orissa).

Dasybatus favus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 377, 1913 (copied).

Head to hind spiracle edge 7½ in total length. Snout 1⅓ in head to hind spiracle edge, rather produced; eyes small, widely separated; mouth large; teeth white, transverse ridge feeble even on unworn teeth; on mouth floor 2 bluntly triangular processes with irregularly serrated margins and joined together by similarly serrated ridge. Spiracle large, 5⅗ in head.

Skin without denticles with stellate bases.

Tail slender, tapering (spine apparently removed in photograph, its insertion about first thirteenth in tail length); pectorals form very flat disk, broadly rounded, length 1¾ in tail.

Dorsal surface of disk very dark brown with bold reticulation of dull yellow, becomes less regular on fore part of disk; yellow spot or streak in middle of most of meshes of reticulations. Ventral surface white. Length, 1,300 mm. across disk. (Annandale.)

India. According to Garman "apparently a variety of *D. uarnak.*"

Subgenus PASTINACHUS Rüppell

DASYATIS BENNETTII (Müller and Henle)

Trygon bennettii MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 160, pl. 52, 1841 (type locality: China and Trinidad).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 480, 1870 (China, India, British Guiana).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e Note, p. 77, 1929 (Cochinchina).

Trygon bennetti MÜLLER and HENLE, Syst. Beschr. Plagiostomen, pl. 52, 1841.—RICHARDSON, Ichth. China Japan. p. 197, 1846 (China Sea).—GRAY, List fish British Museum, p. 118, 1851 (China).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 2, p. 55, 1865 (Amoy).—DAY, Fauna British India, Fishes, vol. 1, p. 52, 1889.

Trygon bennetii ELERA, Cat. Fauna Filip., vol. 1, p. 620, 1895 (Luzon, Manila).

Trygon (Hemitrygon) bennetti DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 595, 1865 (no locality).

Dasybatus bennetti GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 383, 1913 (compiled).

Dasybatus (Pastinachus) bennetti CHEVEY, Inst. Océanogr. Indochine, 19^e Note, p. 7, 1932 (Cambodge).

Dasyatis bennettii FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (reference).

Dasyatis bennetti FOWLER, Hong Kong Nat., vol. 1, p. 178, 1930 (compiled).

Trygon carnea RICHARDSON, Ichth. China Japan, p. 197, 1846 (type locality: China Sea, Macao).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 595, 1865 (reference).

Head to hind spiracle edge 8⅖ in total length. Snout 1⅖ in head to hind spiracle edge, as seen above ends in nearly even triangular point; eye 5, 3½ in snout, 2⅖ in interorbital; mouth width 2⅗ in preoral length; internarial 2; interorbital 2 in head to hind spiracle edge. Spiracle close behind and little larger than eye, interspiracle space 1⅞.

Skin smooth in young, with age rough with pavement of scales and tubercles on middle of back and tail, asperities less close set behind caudal spine.

Tail with serrated spine about first eighth its length, long as snout; narrow fold below about long as caudal spine; pectorals form subrhomboid disk, length 2⅓ in tail, very slightly longer than wide, front edges nearly straight, outer angles and hind edges broadly rounded.

Above grayish yellow, tail darker. Below white. (Müller and Henle.)

India, China, Cochin China, Amoy. Also reported from the Philippines by Elera. Duméril gives the length of an example in the Paris Museum as 914 mm.

DASYATIS LATUS (Garman)

Trygon lata GARMAN, Bull. Mus. Comp. Zool., vol. 6, p. 170, 1880 (type locality: Hawaiian Islands).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 493, 1910 (copied).

Dasibatis lata (Garman) Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 67, 1883 (type).

Dasyatis lata Jordan and Evermann, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903), p. 47, 1905 (copied).

Dasybatus latus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 383, pl. 32, fig. 1–2, 1913 (type).

Dasyatis latus Fowler, Mem. Bishop Mus., vol. 10, p. 24, 1928 (Honolulu; type of *Dasyatis sciera*); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Hawaii).

Trygon tuberculata (not Bonnaterre) Günther, Cat. Fishes British Mus., vol. 8, p. 480, 1870 [type locality: Sydney (not American materials)].—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 378, 1881 (Port Jackson).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 20, 1888 (Port Jackson).

? *Trygon pastinaca* (not Linnaeus) Macleay, Proc. Linn. Soc. New South Wales, vol. 5, p. 313, 1880 (Port Darwin; Port Jackson).

Dasyatis thetidus (Ogilby) Waite, Mem. Australian Mus., vol. 4, p. 46, 1899 (type locality: Newcastle Bight and off Wata Mooli, New South Wales).—McCulloch, Zool. Res. *Endeavour*, vol. 3, p. 104, 1915 (description in key); Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 462, pl. 40, fig. 1–2, text figs. 1 (tail), 3 (back of female), 1921 (off North Head, New South Wales, 20–40 fathoms); Fishes of New South Wales, ed. 2, p. 12, 1927.

Dasyatis thetidis Stead, Fishes of Australia, p. 233, 1908 (New South Wales).

Dasyatis sciera Jenkins, Bull. U. S. Fish Comm., vol. 22 (1902), p. 421, pl. 1, fig. 2, 1904 (type locality: Honolulu).—Snyder, Bull. U. S. Fish Comm., vol. 22 (1902), p. 515, 1904 (Honolulu).—Jordan and Evermann, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903), p. 47, pl. 4, fig. 2, 1905 (type).

Depth 21⅗ to end of tail; head 7⅔; disk length 1⅕ its width, 1⅚ in tail. Snout 1⅓ in head, ends in very slight point of broad angle; eye 6¾, 5 in snout, 3½ in interorbital; dentary width 3½ in head, 1⅓ in internasal; teeth in 40 to 44 rows in jaws (not 26 very oblique series as given by Jordan and Evermann); row of 8 fleshy points along floor of mouth; nostril large pit, simple, internarial broader than mouth; interorbital 2 in head, nearly level. Gill openings equidistant, last shortest. Spiracle large, deep, about 1½ eye diameters, edges entire.

Skin smooth. Caudal spine extracted. Tail rather rough or asperous terminally above.

Dorsal rudimentary, only as very slight, short median keel behind caudal spine; anal as long low median cutaneous keel below; pectorals form partly quadrangular disk, their outer hind edges slightly convex; broad ventrals rather short.

Uniform brown above. Tail dusky terminally. Under surface whitish, with pale brownish on outer marginal portions of pectorals.

Hawaiian Islands. Garman said of the tail "with top and sides armed with small tubercles and an irregular series of broad-based tubercles along each side. A pair of large erect compressed tubercles in front of the caudal spine, a single tubercle above the middle of the pelvic arch, three larger, elongated tubercles the points of which extend backward above the middle of the shoulder girdle."

U.S.N.M. No. 64125. Honolulu. O. P. Jenkins. Length, 1,032 mm. Type of *Dasyatis sciera*.

DASYATIS SEPHEN (Forskål)

Raja sephen FORSKÅL, Descript. Animal., pp. VIII, 17, 1775 (type locality: Djedda, Lohaja, Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1508, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 533, 1792 (copied).—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 122, 1798 (Red Sea).—SCHNEIDER, Syst. Ichth. Bloch, p. 360, 1801 (Red Sea).—SHAW, General zoology, vol. 5, p. 288, 1804.

Raia sephen BONNATERRE, Tableau Encylop. Ichth., p. 4, 1788 (Red Sea).—CUVIER, Règne animal, vol. 2, p. 137, 1817 (reference).

Trygonobatus sephen BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 112, 1816 (name only).

Trigon (*Pastinachus*) *sephen* RÜPPELL, Atlas Reise Nördl. Afrika, Fische, p. 52, 1828.

Trigon sephen RÜPPELL, Neue Wirbelth. Fische, p. 69, 1835 (reference).

Trygon sephen GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 482, 1870 (Indian Ocean, East Indies, Pinang, Seychelles).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Port Mackey).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 853, 1876 (New Britain).—DAY, Fishes of India, pt. 4, p. 740, pl. 195, fig. 2, 1878.—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, p. 212, 1883 (Lower Burdekin River); vol. 9, p. 64, 1884 (Lower Burdekin River in salt water).—OGILBY, Cat. Fish. Australian Mus., pt. 1, p. 20, 1888 (Burdekin River; South East New Guinea).—DAY, Fauna British India, Fishes, vol. 1, p. 50, figs. 21–22, 1889.—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.—BOULENGER, Proc. Zool. Soc. London, 1892, p. 136 (Muscat).—WEBER, Zool. Ergebn. Reise Niederländ. Ost.-Indien, p. 458, 1894 (Java, in fresh water).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 194, 1904 (Kuala Lumpur).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 240, 1907 (Palembang).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 35, 1909 (off Burma).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 384, 1910 (New Pomerania; Pelew Islands).—PEARSON, Ceylon Administr. Rep., 1912–13, p. E13.—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E41, E42, E45, E48, E50.—WEBER, *Siboga* Exped., Fische, vol. 57, p. 604, 1913 (Aru Islands).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math-phys. Kl., vol. 26, p. 8, 1913 (Mekran and Oman).—BAMBER, Journ. Linn. Soc. London, vol. 31, Zool., p. 478, 1915 (Sudanese Red Sea).—PEARSON, Ceylon Administr. Rep., 1915–18, p. F12.—OGILBY, Mem. Queensland Mus., vol. 5, p. 87, 1916 (Moreton Bay and Lower Burdekin River).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e Note, p. 77, 1929 (Cochinchina).

Trygon (*Hypolophus*) *sephen* KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 680, 1871 (Red Sea).

Hypolophus sephen MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 170, 1841 (India; Red Sea).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, pt. 2, p. 429, 1849 (Sea of Pinang, Malay Peninsula, Singapore).—BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal).—GRAY, List Fish British Museum., p. 123, 1851 (India).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 77, 1852 (Batavia, Samarang, Gresik, Surabaja, Kammal, Surakarta); (Bengal), vol. 25, p. 9, 1853 [on *Wolga* *tenkee* Russell, Fishes of Coromandel, vol. 1, p. 2, pl. 3 (Vizagapatam), p. 15 (on *Raia sancur* Buchanan-Hamilton), p. 82, 1803 (reference)].—Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 37, 1860 (Calcutta).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 616, 1865 (Red Sea).—Day, Fishes of Malabar, p. 279, 1865.—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 461 (Baram, North Borneo).—Ogilby, Mem. Queensland Mus., vol. 5, p. 87, 1916 (Moreton Bay).—Hora, Mem. Asiatic Soc. Bengal, vol. 6, p. 465, 1924 (Tale Sap, Outer Lake, Singora).

Hypolophus sepheni Suvatti, Index Fish. Siam, p. 5, 1937 (on Hora).

Dasyatis sephen Stead, Fishes of Australia, p. 233, 1908 (New South Wales).—Fowler, Proc. Acad. Nat. Sci Philadelphia, vol. 79, p. 256, 1927 (Orion, Philippines); Journ. Bombay Nat. Hist. Soc., vol. 33, p. 102, 1928 (Bombay; Philippine example); Mem. Bishop Mus., vol. 10 p. 25, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (East Indies; Philippines); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (note).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 16, 1937 (reference).—Fowler, List Fish. Malaya, p. 17, 1938 (reference).

Dasyatis (*Pastinachus*) *sephen* Tortonese, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, p. 12, 1935–36 (Mar Rosso; Massaua).

Dasybatus sephen Garman, Mem. Mus. Comp. Zool., vol. 36, p. 384, 1913 (Indian Ocean, Red Sea, East Indies, India).—Suvatti, Index Fish. Siam, p. 6, 1937 (Bangkok; Thale Sap, Inner Lake).

Dasybatus (*Pastinachus*) *sephen* Chevey, Inst. Océanogr. Indochine, 19^e Note, p. 7, 1932 (Cochinchina; Cambodia).

Pastinachus sephen McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—McCulloch, Fishes of New South Wales, ed. 2, p. 12, pl. 3, fig. 37a, 1927.

Raia sancur Buchanan-Hamilton, Fishes of Ganges, p. 2, 1822 (type locality: Ganges River).

Trigon forskalii Rüppell, Atlas Reise Nördl. Afrika, Fische, p. 53, pl. 13, fig. 2, 1828 (type locality: Red Sea).

Trygon wogla-tenkee Cuvier, Règne animal, ed. 2, vol. 2, p. 399, 1829 (on *Wogla-tenkee* Russell).

Taeniura atra Macleay, Proc. Linn. Soc. New South Wales, vol. 7, p. 598, 1883 (type locality: New Guinea).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 401, 1913 (copied).—Fowler, Mem. Bishop Mus., vol. 10, p. 25, 1928 (copied); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Pastinachus sephen ater Whitley, Rec. Australian Mus., vol. 18, No. 3, p. 99, 1931 (type of *Taeniura atra;* Burdekin River).

Taeniura mortoni Macleay, Proc. Linn. Soc. New South Wales, vol. 8, pt. 2, p. 212, 1883 (type locality: Lower Burdekin River, Queensland); vol. 9, p. 64, 1884 (copied).—Ogilby, Mem. Queensland Mus., vol. 5, p. 87, 1916 (note).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 30, 1925 (reference).

Taeniura lymma (not Forskål) Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 20, 1888 (type of *Taeniura mortoni;* Cape York).

Depth 11¼ to 15½ to end of tail; head 6⅔ to 10½; disk length 1⅛, 1¼ in its width, 1 to 1½ in tail. Snout 1⅓ to 1¾ in head, forms short point of wide blunt front profile angle; eye 4⅔ to 5½, 3 to 3⅞ in snout, 2⅗ to 4 in interorbital; dentary width 2⅘ to 3 in head; teeth in 20 rows in jaws, upper dental plate bent forward and lower plate more flattened, largest upper teeth each side of middle little broader than long; nostrils simple, deep pits, internarial about equals dentary width; interorbital 1⅗ to 1⅔, nearly level. Gill openings moderate, equidistant, last smallest. Spiracle twice eye, deep, edges entire.

Skin of young smooth, with age finely and closely roughened all over middle of disk, 1 or 2 caudal spines present, second larger or nearly long as head.

No dorsal; anal as broad cutaneous fold 2 or 3 times deep as tail and extends more than half way to its slender tip; pectorals form partly quadrangular disk, angles obtuse and hind edges nearly straight; ventral short, wide, obtuse, hind edges convex; claspers short, narrow, slenderly pointed.

Back uniform brown. Below whitish. Anal fold blackish.

Red Sea, Arabia, Seychelles, India, Ceylon, Burma, Malay Peninsula, Pinang, East Indies, Philippines, Indo-China, Melanesia, Micronesia, Queensland, New South Wales. A well-marked species, readily known by its deep anal fold. According to Whitley the type of *Taeniura atra* measures 899 mm. and is still in the Australian Museum. The types of *Taeniura mortoni* are lost, though the Australian Museum has a specimen from Macleay's Burdekin River collection which agrees with his brief description, as follows:

Disk covered with minute spines and 3 or 4 round flattened tubercles in line of back on scapular region; sides of disk smooth or finely granular. Tail ½ longer than body, with broad rayless fin beneath extending to extremity; disk subcircular. Disk dark brown in center, sides pale color.

7448. Bolalo Bay. December 21, 1908. Length, 780 mm.

5531. Catbalogan. April 16, 1908. Length, 400 mm.

8291. Sorsogon market, Luzon. March 12, 1909. Length, 900 mm.

U.S.N.M. No. 39082. Burdekin River, Queensland. Australian Museum. Length, 1,070 mm.

DASYATIS GRUVELI Chabanaud

Dasybatus (*Pastinachus*) *gruveli* CHABANAUD, Bull. Mus. Hist. Nat. Paris, p. 45, fig. 1, 1923 (type locality: Gulf of Siam); Service Océanogr. Pêches Indo-Chine, 1^e^ Note, p. 6, 1926 (Gulf of Siam).

Dasyatis gruveli FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (reference).

Snout angle very obtuse, snout equals interorbital; eyes very protruded, somewhat larger than their apertures, longitudinally equals ⅔ mouth length; upper jaw forms sharp angle at symphysis drawn in reversed V with branches curved in obtuse angle and lower jaw strongly undulated; teeth yellowish, many smaller upon middle of upper jaw; oral papillae 4, median pair very close together; interorbital flat.

Skin soft above, with small asperities upon snout, interocular and crown, larger and very rough on back medially posteriorly and base of tail, upon middle of back form 3 or 4 longitudinal series of large convex scutes.

Tail nearly 2¼ times disk, strongly depressed basally; single spine inserted little before first third in tail; lower fold extends from first fourth of tail nearly ¾ total tail length; pectorals partly rhomboidal, front lateral edges partly convex, outer angles rounded, hind edges partly rectilinear; ventrals with outer angles rounded.

Gray-brown above, darker medially, below tail and especially terminally. Lower fold of tail brown passing to black at its free border. Below disk and tail whitish. Length, 1,000 mm. (Chabanaud.)

Gulf of Siam. Said to be related to *Dasyatis sephen* in body more convex, pectorals short before snout, and 4 oral papillae instead of 5.

DASYATIS AGULHENSIS Barnard

Dasybatis agulhensis BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 78, 1925 (type locality: Agulhas Bank, South Africa).

Snout obtusely angular, with small median point; eyes small, closer together than spiracles; teeth in about 46 rows, not angularly bent, each tooth more or less hollowed in center; cutaneous flaps on mouth floor 9, 3 median, 1 submedian, and 2 lateral; outer angles of internasal flap quadrate.

Disk smooth, except 3 or 4 small tubercles on radiate bases on point of snout, 1 or 2 slightly larger ones before each orbit and 4 compressed spinelike scutes in middle of back between posterior gills. Tail tuberculate.

Tail 1⅓ times body length, not basally depressed, with lower cutaneous fold extending from beneath spine to or almost to tip, about ⅓ tail depth; single caudal spine length ½ its distance from tail base; pectorals form disk little wider than long, front margin of pectoral slightly longer than hind margin also straight or slightly concave, lateral and posterior angles rounded.

Uniform bluish slate. Length, 1,905 mm. (Barnard.)

South Africa.

DASYATIS SCHREINERI (Gilchrist)

Trygon schreineri GILCHRIST, Trans. Roy. Soc. South Africa, vol. 3, p. 33 (text fig.), 1913 (type locality: "Off the rocks at St. James in False Bay").

Dasybatus schreineri VONBONDE and SWART, Marine Biol. Surv. South Africa Rep., pt. 3, 1922, p. 16, 1924 (reference).

Dasyatis schreineri BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 76, 1925 (False Bay, Agulhas Bank to 40 fathoms).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 409, 1934 (Natal).

Eyes small; teeth with transverse ridges, in about 33 to 48 rows; 5 oral papillae on mouth floor; outer angles of internasal flap rounded; interorbital less than interspiracle width.

Disk smooth. Tail tuberculate. Series of 7 median spines, increasing in length to sixth, which about 1/3 length of tail, seventh considerably less.

Tail subequal to body length, with cutaneous fold below ending before tip of tail, deepest anteriorly where 3/4 diameter of tail above; large caudal spine preceded by small one; pectorals form disk little wider than long, front edges also longer than hind edges; front profile of disk as seen above broadly convex, with very small median point, lateral and posterior angles rounded.

Dark greenish slate above, whitish below. Reaches 1,830 mm. (Barnard.)

South Africa. The type destroyed.

DASYATIS BREVICAUDATUS (Hutton)

Trygon brevicaudatus HUTTON, Ann. Mag. Nat. Hist., ser. 4, vol. 16, p. 317, 1875 (type locality: Dunedin Harbor, New Zealand); Trans. Proc. New Zealand Inst., vol. 8, p. 216, 1876.

Dasybatis brevicaudatus HUTTON, Index Fauna New Zealand, p. 53, 1904.

Dasybatus brevicaudatus WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 151, pl. 22, 1909 (off Table Cape and Bay of Plenty, 34–55 fathoms).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 385, 1913 (New Zealand).

Dasyatis brevicaudatus MCCULLOCH, Biol. Res. *Endeavour*, vol. 3, pt. 3, p. 102, pl. 15, fig. 1, pl. 17, fig. 1, 1915 (Bass Strait, in 60 fathoms).—MCCULLOCH and WAITE, Trans. Proc. Roy. Soc. South Australia, vol. 39, p. 461, 1915 (Great Australian Bight, in 22 fathoms).—WAITE, Rec. South Australian Mus., vol. 2, p. 31, fig. 44, 1921.—MCCULLOCH, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 462, text fig. 2 (tail), 1921 (New South Wales and South Australia, in 20–40 fathoms); Fishes of New South Wales, ed. 2, p. 12, pl. 3, fig. 36c, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (reference).

Bathytoshia brevicaudata WHITLEY, Rec. Austral. Mus., vol. 19, No. 1, p. 61, 1933 (reference).

Trygon thalassia (not Müller and Henle) HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 85, 1872 (dried tail); Trans. New Zealand Inst., vol. 8, p. 216, 1876.

Trigon thalassia HECTOR, Handb. New Zealand, p. 16, 1879.

Head to hind spiracle edge 5 9/10 in total length. Snout 1 1/2 in head to hind spiracle edge; eye 8, 6 in snout, 4 in interorbital; mouth width slightly less than 1 1/2 in preoral length; lateral teeth tubercular, inner each with angular cusp with longest on median line; broad fimbriated flap behind upper jaw and 5 papillae inside lower, of which outer pair smaller than and remote from other 3; internarial little less than their distance from snout tip, outer angles of lobe acute, hind edge with narrow papillose flap forming 2 small lobes near median line; interorbital 2 1/4 in head to hind spiracle edge. Spiracles very large, longer than broad, 1 7/8 in interorbital.

Disk smooth above and below. Tail smooth basally, few small scattered spines on sides level with spine insertion more numerous and finally rough terminally.

Tail very slightly shorter than rest of body, depressed before and cylindrical behind spine, which inserted little before first third of tail, length equals head to hind spiracle edge; tail with low cutaneous fold on under surface below caudal spine; pectorals form subquadrangular disk, length 1⅙ in its width, angle of snout broadly obtuse, front edges indistinctly sinuous, outer angles rounded, posterolateral borders little convex, nearly straight and form obtuse angle with inner margins; ventrals with convex margins, angles somewhat rounded.

Uniform pale grayish brown above, white below. Width, 1,080 mm. (McCulloch.)

South Australia, New South Wales, Bass Strait, New Zealand.

Subgenus DASYATIS Rafinesque

DASYATIS PASTINACUS (Linnaeus)

Raja pastinaca LINNAEUS, Syst. Nat., ed. 10., vol. 1, p. 232, 1758 (type locality: Europe).—FORSKÅL, Descript. Animal., p. XVIII, 1775 (Malta).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1509, 1789 (Europe, Red Sea, Indian Sea.).—WALBAUM, Artedi Pisc., vol. 3, p. 527, 1792 (on Linnaeus).—FORSTER, Fauna Indica, p. 13, 1795.—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 114, 1798 (compiled).

Trygon pastinaca BONAPARTE, Icon. Fauna Italica, Pesci, vol. 3, pt. 2, fasc. 6, descr., pl., 1834 (Italy); Cat. Metod. Pesci Europei, p. 12, 1846 (Mediterranean; Atlantic).—NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 320, 1922 (Natal).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).

Trigon pastinaca GUIGHENOT, Notes ile Réunion, vol. 2, p. 32, 1863.—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 4, 1891.

Dasyatis pastinaca FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 474 (Italy; Beirut, Syria); 1923, p. 35 (Beirut example).

Dasybatus pastinacus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 389, 1913 (Eastern Atlantic; Mediterranean).

Dasybatis pastinacus BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 77, pl. 4, fig. 8, 1925 (Agulhas Bank to Natal Coast).

Trygon vulgaris RISSO, Hist. Nat. Europe merid., Poissons, vol. 3, p. 160, 1826 (type locality: Nice).

Pastinaca laevis GRAY, Cat. Fish Gronow, p. 11, 1854 (type locality: Atlantic coasts of Europe).

Trygon pastinaca var. *marmorata* STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-Nat. Kl., vol. 59, p. 381, pl. 3, fig. 1, 1892 (type locality: Bay of Goreé, Senegambia).

Depth 5½ to 7 in length of disk (measured to hind pectoral edge); head to first gill opening 2⅘. Snout 1⅖ to 1⅔ in head; eye 5 to 7, 4 to 5½ in snout, 3 to 3½ in interorbital; mouth width 2⅞ to 3⅛ in head to first gill opening; teeth in 23 to 33 rows above, 22 to 32 below, small, with obtuse points or cusps; preoral length 1½ to 1¾ in head; internarial 2⅘ to 3½; interorbital 1½ to 1⅞, depressed, with eyes little elevated each side. Spiracles 1¼ to 1½ times larger than eyes. Third gill opening largest, subequal with eye.

Skin smooth.

Tail slightly longer than disk, with short low fold behind tip of spine and longer lower one below, spine about equals interorbital; pectorals form broad subquadrangular disk, length 1⅕ to 1¼ its width, front edge nearly straight or but slightly convex, hind edge slightly convex; ventral broad, obtuse.

Above ecru drab to fawn color, outer margins of disk pale, tail also deeply colored like middle of back. Under surface of disk creamy white, with outer margins of pectorals broadly pale brown.

South Africa, Natal, Madagascar, India. Also in the Atlantic.

380 to 384 A.N.S.P. Italy. C. L. Bonaparte. No. 219. Dr. T. B. Wilson. Length, 315–410 mm.

Subgenus AMPHOTISTIUS Garman

DASYATIS SINENSIS (Steindachner)

Trygon sinensis STEINDACHNER, Anz. Akad. Wiss. Wien, vol. 29, p. 133, 1892 (type locality: Shanghai); Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 59, p. 382, pl. 6, 1892 (type).

Dasybatus sinensis GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 393, 1913 (Shanghai).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 166, figs. 12–12a, pl. 5, fig. 7 (teeth), pl. 4, fig. 1 (scale), 1932 (Antung).

Dasyatis sinensis FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (reference); Hong Kong Nat., vol. 1, p. 179, 1930 (compiled).

Head to hind spiracle edge 6⅖ in total length. Snout 1⅓ in head to hind spiracle edge, as seen from above upper edge forms point slightly less than right angle; eye 11, 8¼ in snout, 5 in interorbital; mouth waved; about 30 rows of upper teeth, pointed in male; 5 oral papillae, 3 close together, forward, others wider spaced near mouth angles; internarial slightly greater than mouth width, hind edge very slightly waved; interorbital 2⅖ in head to hind spiracle edges. Spiracle close behind eye, equals 2¼ eye diameters, interspace 2¼ in head to hind spiracle edge.

Finely roughened above snout, over interorbital, branchial region and back toward caudal spine, with asperities slightly larger on vertebral line.

Tail tapers, filamentous, spine removed though inserted near first fifth of tail, with dermal fold above and little higher and longer one below; pectorals form rhomboidal disk, front edge largely convex, angles widely convex and hind edges nearly straight; ventrals with wide hind edges, obtuse; claspers robust, long as interorbital.

Above and medially light gray, with broad lateral yellowish brown edges. Disk length, 320 mm.; tail, 510 mm. (Steindachner.)

China.

DASYATIS FLUVIORUM Ogilby

Dasyatis fluviorum OGILBY, Proc. Roy. Soc. Queensland, vol. 21, p. 6, 1908 (type locality: Brisbane River, above tides).—MCCULLOCH, Biol. Res. *Endeavour*, vol. 3, pt. 3, p. 103, pl. 16, fig. 1, pl. 17, fig. 2, 1915 (Brisbane River and Port Jackson).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 12, pl. 3, fig. 36b, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (compiled).

Dasybatus fluviorum TOSH, Marine Biol. Rep. Queensland, pl. 4, fig. 3, 1903.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 394, 1913 (compiled).—OGILBY, Commerc. Fish Fisher. Queensland, p. 45, 1915 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 130, 1916 (Nerang Creek; Great Sandy Strait; Moreton Bay).

Toshia fluviorum WHITLEY, Rec. Austral. Mus., vol. 19, No. 1, p. 60, 1933 (reference).

Trygon pastinaca (not Linnaeus) MACLEAY, Proc. Linn. Soc. New South Wales, vol. 2, p. 366, 1878 (Port Darwin).—GÜNTHER, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 37, 1880 (Arafura Sea).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 377, 1881 (Port Darwin; Port Jackson).—OGILBY Cat. Fishes Australian Mus., pt. 1, p. 19, 1888 (Port Jackson).—KENT, Great Barrier Reef, p. 267, 1893 (Queensland).

Head to hind spiracle edge 8½ in total length. Snout 1⅗ in head to hind spiracle edge, seen above snout forms obtuse angle slightly projecting beyond front contour; eye 6, 4 in snout, 3⅔ in interorbital; mouth width equals internarial between front nasal angles, jaws undulated; lower lip corrugated; upper jaw succeeded by wide, fimbriated, membranous flap, bearing 30 cilia on free border; mouth floor with 7 papillae in 3 groups; free edge of nasal flap minutely fringed; interorbital 1⅘ in head to hind spiracle edge. Spiracles close behind eyes, little larger, interspace about equals interorbital.

Row of small, open, mucigerous papillae between snout tip and frontal depression; each preorbital group with much larger group, extending backward above and below eye and united to rostral system by oblique series of single pores; small, irregular cluster outside and partly anterior to preorbital group; semicircular series either side of and pair transversely within occipital depression; crescentic biserial band of subcutaneous tubular pores below and well outside eye; similarly situated oval cluster below spiracles. Small group of blunt tubercles above each spiracle, from which more or less extended series curves forward along superciliary edge; transverse row of 3 tubercles behind occipital depression, from behind middle one series of retrorse spines extends along dorsal ridge and continues on tail nearly to caudal spine base; 1 of median interscapular spines slightly larger than others of vertebral series; entire scapular region tuberculigerous, central group quinqueradiate, one branch directed forward along and converging on axial series, 2 directed outward to level with spiracle and 2 backward but somewhat divergent from axis; on either side between basal angles of outer and hinder branches 2 or 3 enlarged tubercles. Spinous tubercles of tail, especially 4 nearest caudal spine, larger than those of dorsal ridge; sides of tail with few scattered prickles.

Tail elongated, slender, with upper short fold, highest posteriorly and overlapped in front by caudal spine, lower surface of tail with much larger and slightly higher fold which originates below base of caudal spine; caudal spine inserted about first sixth in tail length, long as snout; pectorals form subcircular disk, length very slightly less than width or about half tail length, front edges linear, outer angles widely obtuse, hind borders rather feebly and inner moderately convex; outer ventral border nearly straight, long as snout.

Olive brown above, edges of disk and ventral fins lighter. Tail black, lower surface and sides of basal fourth brown. Spine and tubercles whitish. Lower surfaces bluish white, discal borders brown. Length, about 794 mm. (Ogilby, McCulloch.)

New South Wales, Queensland.

DASYATIS USHIEI Jordan and Hubbs

Dasyatis ushiei JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 114, 1925 (type locality: Mikawa Bay, Japan).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (compiled).

Snout tip but slightly produced, front angle 150°; eyes somewhat elevated; mouth width about ¼ less than internarial, little less than half preoral, which ⅓ space from mouth to inner hind angle of ventrals; only 23 oblique rows of upper teeth; 7 oral papillae, in 3 groups of which median comprises 3 papillae; interorbital flattish, ⅔ long as snout. Orbit large as spiracle which rhomboid and faces about equally outward, upward, and forward.

Body smooth and smooth shagreen only on posterior ¾ of tail.

Tail little more than twice disk length, slightly compressed anteriorly, terete and whiplike behind spine base; its upper edge with rudimentary keel shorter than orbit located not far behind spine base and lower edge with very low fold with origin opposite spine base extending nearly ⅓ of space to tail tip, where grading into low keel, covered with shagreen, which extends almost to extreme tail tip; pectorals form disk nearly ¼ broader than long, front margin nearly straight.

Above gray, with some blackish margins of irregular form and disposition. Tail mostly blackish, white mottled with darker on lower surface of thickened basal portion. Disk white below, with darker clouds towards margin posteriorly. Length, 988 mm. (Jordan and Hubbs.)

Japan.

DASYATIS NAVARRAE (Steindachner)

Trygon navarrae Steindachner, Anz. Akad. Wiss. Wien, vol. 29, p. 132, 1892 (type locality: Shanghai); Denkschr. Akad. Wiss. Wien, Math.-nat. Kl., vol. 59, p. 381, pl. 5, 1892 (type).

Dasybatus navarrae Garman, Mem. Mus. Comp. Zool., vol. 36, p. 393, 1913 (Shanghai).—Lin, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, No. 5, p. 167, figs. 13–13a, pl. 5, fig. 8 (teeth), 1932 (Tsigtao).

Dasyatis navarrae Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (reference); Hong Kong Nat., vol. 1, p. 180, 1930 (compiled).

Dasyatis bennetti (not Müller and Henle) Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 164, pl. 65, 1909 (Takao).

Head to hind spiracle edge 9⅗ in total length. Snout 1⅓ in head to hind spiracle edge; eye 6⅖, 5 in snout, 3⅖ in interorbital; mouth width 2½ in interspace between first pair of gill openings; margin of nasal flap with short fringe; interorbital 2 in head to hind spiracle edge. Spiracles little larger and close behind eye, interspace 1⅔ in head.

Median vertebral row of short strong spines begin behind branchial region and extend to caudal spine; tail largely and over terminal portion above roughened by minute spine-like tubercles.

Tail long, whiplike, with serrated spine 2 in head to hind spiracle edge; behind reflexed spine very short low fold on top of tail extends back for space equal to interorbital; below and beginning under spine low black cutaneous fold extends back 3 times interorbital; pectorals form rhomboid disk, long as wide or 2¼ in tail, front edges nearly straight, outer angles rather evenly convex and hind edges slightly convex; ventrals obtuse, width 1¼ in interorbital.

Uniform blackish above, pale below. Tail without bands. Length, 1,145 mm. (Jordan and Richardson.)

China, Formosa. The type, a mature male with the disk 330 mm. long, had a band of minute denticles longitudinally over each eye, along the vertebral column and grouped about the center of the disk.

DASYATIS KUHLII (Müller and Henle)

Trygon kuhlii Müller and Henle, Syst. Beschr. Plagiostomen, p. 164, pl. 50, 1841 (type locality: Vanicoro, New Guinea, India).—Schlegel, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 308, 1850 (Japan).—Gray, List fish British Museum, p. 120, 1851 (reference).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 73, 1852 (Batavia; Samarang); (Japan), vol. 25, p. 22, 1853 (Japan, East Indies, New Guinea, Vanicolo, West India): (Bengal), vol. 25, p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 7, p. 228, 1854 (Macassar); vol. 10, p. 348, 1856 (Rio, Bintang); Act. Soc. Sci. Ind. Néerl., vol. 1, No. 3, pp. 8, 10, 1856 (Macassar); vol. 2, No. 7, p. 9, 1857 (Amboina); Nat. Tijdschr. Nederland Indië, vol. 20, p. 141, 1859–60 (Badjoa, Boni).—Kner, Reise *Novara*, Fische, p. 420, 1865 ("Auckland").—Günther, Cat. Fishes British Mus., vol. 8, p. 479, 1870 (Zanzibar; East Indies).—Hector, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 85, 1872 (Kner's Auckland record).—Peters, Monatsb. Akad. Wiss.

Berlin, 1876, p. 853 (New Ireland).—DAY, Fishes of India, pt. 4, p. 739, pl. 193, fig. 2, 1878 (Madras).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 49, 1885 (North Celebes).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 19, 1888 (Parramatta River, New South Wales; Malay Archipelago; Tonga; Port Essington; Ugi, Solomons; South East New Guinea).—DAY, Fauna British India, Fishes, vol. 1, p. 52, 1889.—ANNANDALE,, Mem. Indian Mus., vol. 2, p. 34, 1909 (off Gopalpur, 24 fathoms).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 494, 1910 (New Caledonia, New Mecklenburg, Tongatabu, Samoa).—PEARSON, Ceylon Administr. Rep., 1912–13, p. E12.—WEBER, *Siboga* Exped., vol. 57, Fische, p. 603, 1913 (Makassar, Sulu, Menado, Saleyer).—PEARSON, Ceylon Administr. Rep., 1914, pp. F4, F10, F15, F16, F18.—RAJ, Rec. Indian Mus., vol. 10, p. 317, 1914 (habits).—MALPAS, Ceylon Administr. Rep., 1921, pp. E5–E8; 1922, p. F6.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6e Note, p. 77, 1929 (Cochin China).

Trygon kuhli BLEEKER, Nat. Tijds. Nederland. Indië, vol. 20, pp. 238, 447, 1859–60 (Singapore).—GÜNTHER, Rep. Voy. *Challenger*, vol. 1, p. 58, 1880 (Tongatabu).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 741, 1900 (Yokohama).—SOUTHWELL, Ceylon Administr. Rep. 1912–13, pp. E41–E48, E50.

Trygon (Trygon) kuhlii DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 603, 1865 (Sea of the Indies, Amboina, Java, Vanicolo, New Guinea).

Trigon kuhlii SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.

Trygon kuhelii PEARSON, Ceylon Administr. Rep., 1915–18, p. F17.

Leiobatus kuhli BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).

Dasybatus kuhlii GARMAN, Proc. U. S. Nat. Mus., vol. 8, p. 40, 1885 (no locality); Mem. Mus. Comp. Zool., vol. 36, p. 395, 1913 (Japan, India, East Indies).—OGILBY, Commerce. Fish Fisher. Queensland, p. 45, 1915 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 87, 1916 (Coolangatta, Currumbin, Merang Creek, Moreton Bay, Port Curtis, Nor West Islet, Edgecombe Bay).—HERRE, Journ. Pan-Pacific Res. Inst., vol 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 12, 1934 (Dumaguete: Capiz; Sitanki).

Dasybatus (Amphotistius) kuhlii CHEVEY, Inst. Océanogr. Indochine, 19e note, p. 7, 1932 (Cochinchina; Cambodia).

Dasybatus kuhli SUVATTI, Index Fish. Siam, p. 6, 1937 (Siracha).

Dasyatis kuhlii JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 42, 1901 (Nagasaki; Yokohama).—TOSH, Marine Biol. Rep. Queensland, pl. 5, fig. 1, 1903.—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 659, 1903 (Hakodate, Tokyo, Misaki, Wakanoura, Onomichi, Hiroshima).—WAITE, Mem. New South Wales Nat. Club, No. 2, p. 11, 1904.—MCCULLOCH, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 46, pl. 39, figs. 1–2, 1921 (off Bustard Head, Queensland, 14–20 fathoms; Parramatta River estuary).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 62, p. 1, 1922 (Cebu).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 11, 1927.—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (Ugi, Solomons).—WHITLEY, Journ. Pan Pacific Inst., vol. 3, p. 11, 1928 (Santa Cruz Islands).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Solomons, Japan, Indian Ocean); Mem. Bishop Mus., vol. 11, p. 314, 1931 (reference).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 270, fig. 24, 1932 (Chefoo).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 111, 1933 (Chusan).—FOWLER, Proc. Acad. Nat.

Sci. Philadelphia, vol. 87, p. 90, 1935 (Bangkok).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 16, 1937 (reference).—FOWLER, List Fish. Malaya, p. 16, 1938 (reference).

Dasyatis kuhli JORDAN and SEALE, Bull. Bur. Fisher., vol. 26, 1906 p. 4, 1907 (Philippines).—SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).—SEALE, Philippine Journ. Sci., vol. 5, p. 264, 1910 (Philippines).

Trygon glauconotus (Kuhl and Van Hasselt) BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 74, 1852 (type locality: Java). (Name in synonymy.)

Raya trigonoides CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 121, 1873 (type locality: New Caledonia).

Dasybatus varidens GARMAN, Proc. U. S. Nat. Mus., vol. 8, p. 40, 1885 (type locality: Hongkong).

Dasyatis varidens FOWLER, Hong Kong Nat., vol. 1, p. 181, 1930 (compiled).

Depth 13⅞ to 14⅕ to end of tail; head 6½ to 8; disk length 1⅕ to 1¼ its width, 1⅓ to 1½ in tail. Snout 1⅖ to 1½ in head, meets at very blunt angle in front; eye 4⅔ to 5 in head, 3 to 3½ in snout, 3 to 3⅔ in interorbital; dentary width 3¼ to 4¼ in head; teeth in 25 to 30 rows in jaws, rhombic, cusps as slight keel; nostrils deep, simple, internarial equals dentary width; interorbital 1⅖ to 1⅘ in head, nearly level. Gill openings small, equidistant, last smallest. Spiracle greatly larger than eye, deep, edges entire.

Skin smooth. Caudal spine extracted.

Dorsal as short, low, median, cutaneous fold behind spine; anal as long and much deeper one below, deep as tail depth; pectoral with outer posterior edges almost straight, angles blunt; ventrals triangular, front edge straight and hind edge little convex.

Brown above, with darker mottling or specks about eyes and interorbital. Variable gray spots, not larger than eye and often with slightly darker marginal rings, scattered about disk, though largest ones posterior at each side of disk. Tail like back, though with 3 distinct buff rings terminally, but crossing dark cutaneous anal. Under surface of disk whitish.

Zanzibar, India, Ceylon, Singapore, East Indies, Philippines, Cochinchina, China, Japan, West Australia, Queensland, New South Wales, Melanesia, Micronesia, Polynesia. Recorded by Kner from Auckland, New Zealand, locality doubtless erroneous. Müller and Henle show a figure with 2 caudal spines, also a very few small rounded blue spots on each pectoral medianly, besides an imperfect row of vertebral spines on back. Garman says: "Skin smooth on the young, later a vertebral series of depressed tubercles appears from the shoulder girdle forward, to be still later continued backward to the caudal spine."

9327. Cebu market. August 17, 1909. Length, 393 mm.
9328. Cebu market. August 17, 1909. Length, 585 mm.
6283. Manila. June 11, 1908. Length, 325 mm.

5110. Sandakan Bay, Borneo. March 3, 1908. Length, 630 mm.

U.S.N.M. No. 6529. Hong Kong. William Stimpson. Length, 350 mm. Type of *Dasybatus varidens*. A young male with rather slender, pointed claspers about equal to internarial space. The contour shows greatest disk width opposite disk center and posterior inclined edges of pectorals slightly convex. Traces of blue blotches or spots on disk medially and tail with at least 3 pale or buff transverse rings terminally. Caudal spine removed.

U.S.N.M. No. 84207. Philippine Islands. Length, 313 mm. (not 613 as given by Fowler and Bean).

U.S.N.M. No. 31516. New Guinea. Australian Museum. Length, 530 mm.

U.S.N.M. No. 26519. No locality. No donor. Length, 390 mm. Only 3 small pale ocelli on right pectoral posteriorly and basally and 2 on left pectoral.

U.S.N.M. No. 39988. Ugi, Solomons. Australian Museum. Length, 535 mm. Well marked, with variable gray ocelli posteriorly on disk above.

U.S.N.M. No. 5800. Zamboanga. Dr. E. A. Mearns. Length, 345 mm., tail cut off near base.

DASYATIS BREVIS (Garman)

Trygon brevis Garman, Bull. Mus. Comp. Zool., vol. 6, p. 171, 1880 (type locality: Payta, South America).

Dasibatis brevis (Garman) Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 70, 1883 (Peru).

Dasybatus brevis Garman, Mem. Mus. Comp. Zool., vol. 36, p. 396, pl. 32, figs. 5–6, 1913 (Peru and California).

Dasyatis brevis Fowler, Mem. Bishop Mus., vol. 10, p. 25, 1928 (Honolulu; type of *Dasyatis hawaiensis*); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Hawaii; California); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (Honolulu).

Dasyatis hawaiensis Jenkins, Bull. U. S. Fish. Comm., vol. 22 (1902), p. 420, pl. 1, fig. 1, 1904 (type locality: Honolulu).—Jordan and Evermann, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903) p. 48, pl. 4, fig. 1, 1905 (type).

Trygon hawaiensis Günther, Journ. Mus. Godeffroy, pt. 17, p. 494, 1910 (copied).

Depth 15⅖ to end of tail; head 7⅔; disk length 1⅛ in its width, 1½ in tail. Snout 1⅖ in head, meets at wide or blunt angle in front; eye 6, 4⅕ in snout, 4 in interorbital; dentary width 3 in head; teeth in 30 rows in jaws rhombic, smooth, cusps barely evident; nostrils deep, simple, internarial slightly greater than dentary width; interorbital 1⅖ in head, nearly level. Gill openings small, equidistant, last smallest. Spiracles greatly larger than eye, deep, edges entire. Skin smooth. Caudal spine about 1⅛ in interspiracle width.

Dorsal as short low median cutaneous fold behind spine; anal as longer and deeper fold; pectorals with outer edges convex, both in front and posteriorly; ventrals rather obtuse, hind edge convex; claspers short and pointed.

Uniform brown above, disk paler marginally. Lower surface of disk whitish. Tail dusky to blackish terminally, also cutaneous dorsal and anal folds.

Hawaiian Islands. Also Peru and California. Garman says "Disk naked in young. Adults have three rows of tubercles on the back."

U.S.N.M. No. 64127. Honolulu. O. P. Jenkins. Length, 420 mm. Type of *Dasyatis hawaiensis.*

DASYATIS AKAJEI (Müller and Henle)

Trygon akajei (Bürger) Müller and Henle, Syst. Beschr. Plagiostomen, p. 165, pl. 53, 1841 (type locality: Southwest coast of Japan).—Richardson, Ichth. China Japan, p. 197, 1846 (copied).—Schlegel, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 308, 1850 (Japan).—Gray, List fish British Museum, p. 120, 1851 (reference).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Japan); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 10, p. 44, 1858 (Nagasaki).—Sauvage, Bull. Soc. Philom. Paris, ser. 7, vol. 5, p. 104, 1881 (Swatow).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 24, 1930 (Far East Seas).

Trygon (Trygon) akajei Duméril, Hist. Nat. Elasmobr., vol. 1, p. 604, 1865 (compiled).

Trygon pastinaca var. *akajei* Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Yokohama, Tschifu, Schott-müller).

Pastinaca akajei (Bürger) Müller and Henle, Syst. Beschr. Plagiostomen, p. 165, 1841 (name in synonymy).

Dasyatis akajei Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 56 (Swatow).—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 42, 1901 (Nagasaki).—Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 319, fig. 2, 1902 (Formosa).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 659, 1903 (Onomichi, Tokyo, Matsushima, Misaki, Wakanoura, Hiroshima, Tsuruga, Hakata, Kawatana, Nagasaki).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 639, 1908 (Japan).—Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 164, fig. 2, 1909 (copied).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 473 (Onomichi example).—Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Otaru, Shioyama, Tokyo, Misaki).—Jordan and Richardson, Mem. Carnegie Mus., vol. 6, p. 6, fig. 4, 1913 (Fusan).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Jusangata).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 114, 1925 (Miyuzu, Mikawa Bay).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Japan).—Schmidt and Lindberg, Bull. Acad. Sci. U. S. S. R., p. 1137, 1930 (Tsuruga).—Fang and Wang, Contr. Biol. Lab. Sci Soc. China, vol. 8, p. 272, fig. 25, 1932 (Chefoo).—Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 111, 1933 (Chusan; Ningpo; Yenting; Chinhai; Haimen; Wenchow).

Dasybatus akajei Garman, Mem. Mus. Comp. Zool., vol. 36, p. 394, 1913 (Japan; China).—Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 12, 1931 (Fusan).—Tanaka, Jap. Fish. Life Colours, No. 32, 1933.

? *Trygon pastinaca* (not Linnaeus) Günther, Rep. Voy. *Challenger*, vol. 1, p. 63, 1880 (Yokohama).

Depth 12 to 17⅗ to end of tail; head 6¼ to 8; disk length 1⅒ to 1⅕ in its width, 1⅕ to 2 in tail. Snout 1⅖ to 1⅗ in head, forms an obtuse angle with very slight point at tip; eye 5¼ to 7 in head, 3½ to 5½ in snout, 3½ to 4½ in interorbital; dentary width 3 to 4 in head; teeth in 20 to 25 rows in jaws, rhombic, each with feeble cusp; nostrils deep, simple, internarial equals dentary width; interorbital 1⅖ to 1¾ in head, nearly level. Gill openings equidistant, subequal or last little shorter. Spiracle large, deep, little larger than eye, close below and along its hind edge.

Skin smooth. Spine nearly or quite equals width between spiracles.

Dorsal as median cutaneous keel behind spine on tail; anal similarly on tail below, only little higher; pectorals form rhomboid disk, outer and posterior angles rounded; ventrals obliquely truncate, angles obtuse.

Uniform brown above, little paler about edges of disk. Whitish below, outer margins of disk little brownish. Tail terminally and membranes representing dorsal and anal dusky to blackish brown.

China, Japan, Korea. Though my specimens are all small Garman says "larger examples with tubercles on the middle of the back above the shoulder girdle, and more advanced stages with a vertebral row of backward-directed tubercles from the back of the head, largest on the base of the tail in front of the caudal spine and with a parallel row on each shoulder." Müller and Henle's figure shows two caudal spines and row of seven vertebral spines at front of back.

U.S.N.M. No. 26544. Japan. Prof. E. S. Morse. Length, 168 mm.

U.S.N.M. No. 50734. Wakanoura, Japan. Jordan and Snyder. Length, 305 mm.

U.S.N.M. No. 57511. Japan. P. L. Jouy. Length, 400 mm. As *Dasyatis kuhlii.*

U.S.N.M. No. 71128. Japan. *Albatross* collection. Length, 298 mm.

U.S.N.M. No. 71906. Tokyo market. *Albatross* collection. Length, 326 mm.

U.S.N.M. No. 71903. Misaki, Japan. *Albatross* collection 1906. Length, 610 mm. One caudal spine. Uniform dark slaty above.

U.S.N.M. No. 71905. Shiogama, Japan. *Albatross* collection 1906. Length, 584 mm. Two caudal spines, upper little longer.

U.S.N.M. No. 22613. Awa, Japan. Japanese Government. Length, 518 mm.

U.S.N.M. No. 51287. Wakanoura, Japan. Jordan and Snyder. Length, 770 mm. Tubercle on tail opposite hind ventral ends and preceded by 3 small vertebral tubercles. Small tubercle in center of disk, preceded by row of 18 small ones.

U.S.N.M. No. 75869. Japan ? P. L. Jouy. Two examples, 525 and 550 mm.

1 example. A.N.S.P. Onomichi, Japan. Jordan and Snyder. Length ?

DASYATIS ZUGEI (Müller and Henle)

Trygon zugei (Bürger) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 165, pl. 53, 1841 (type locality: Japan, China, Pondicherry, India).—RICHARDSON, Ichth. China Japan, p. 197, 1846 (China, Macao).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1408, 1849 (Pinang, Malay Peninsula, Singapore).—SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 309, 1850 (Nagasaki Bay).—GRAY, List fish British Museum, p. 120, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 68, 1852 (Batavia): Nat. Tijdschr. Nederland. Indië, vol. 3, p. 446, 1852 (Banka); Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Bengal); vol. 25, p. 82, 1853 (reference); Nat. Tijdschr Nederland. Indië, vol. 10, p. 348, 1856 (Rio, Bintang); vol. 11, p. 419, 1856 (Muntok, Java); Verh. Batav. Genootsch. (Japan), vol. 26, p. 6, 1857 (Nagasaki); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 3, p. 7, 1857 (Japan); Nat. Tijds. Nederland. Indië, vol.

16, p. 409, 1858 (Japara, Java).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 481, 1870 (Japan, East Indies, Pinang, Madras).—DAY, Fishes of India, pt. 4, p. 739, pl. 190, fig. 3, 1878 (Madras).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 20, 1888 (Madras).—DAY, Fauna British India, Fishes, vol. 1, p. 52, 1889.—ANNANDALE, Mem. Indian Mus., vol. 2, p. 33, pl. 4, fig. 2, 1909 (off Burma and Orissa).—PELLEGRIN, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 4, 1912 (Hong Kong).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 603, 1913 (Java).—PEARSON, Ceylon Administr. Rep., 1915–18, pp. F12–F14.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 77, 1929 (Cochin China).

Trygon (Trygon) zugei DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 606, 1865 (Sea of the Indies, Pondicherry, Macao).

Dasyatis zugei JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, 1901, p. 42 (Nagasaki).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 660, 1903 (Kobe, Tokyo, Wakanoura, Onomichi, Hiroshima).—JORDAN and SEALE, Proc. Davenport Acad. Sci., vol. 10, p. 2, 1905 (Hong Kong).—EVERMANN and SHAW, Proc. California Acad. Sci., ser. 4, vol. 16, p. 99, 1927 (Chefoo).—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 102, 1928 (Bombay); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Japan, Indian Ocean); Hong Kong Nat., vol. 1, p. 180, 1930 (Indian Ocean; Japan).—SCHMIDT and LINDBERG, Bull. Acad. Sci. U.S.S.R., 1930, p. 1187 (Tsuruga).—FOWLER, List Fish. Malaya, p. 17, 1938 (reference).

Dasybatus zugei GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 398, 1913 (Pinang, China, India, Japan, East Indies).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 13, fig. 10, 1929 (Amoy).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 14, 1931 (Nagasaki).—HORA and MUKERJI, Rec. Indian Mus., vol. 38, p. 18, 1936 (Maungmagan, Burma).

Trygon crozieri BLYTH, Journ. Asiat. Soc. Bengal, 1860, p. 45 (type locality: Lower Bengal).

Depth 23 to 25½ to end of tail; head 5 to 5⅓; disk length equals its width, 1⅕ to 1⅖ in tail. Snout 1¼ to 1⅓ in head, extended in rather narrow acute triangle; eye 6 to 8½, 5¾ to 6 in snout, 3 in interorbital; dentary width 4½ in head; teeth in 24 rows in jaws, cusps low or obsolete; nostrils deep, simple, internarial equals dentary width; interorbital 2⅘ to 3¾ in head, level, fontanel depression little concave. Gill openings equidistant, subequal or last but little shorter. Spiracle much larger than eye, broad, deep, close below and along hind eye edge.

Skin smooth. Spine greater than interspiracle width or 1⅗ in snout.

Dorsal as median cutaneous keel behind dorsal spine on tail; anal as slightly higher and longer keel on tail below; pectorals form quadrangular disk and rounded on outer angles and posteriorly; ventrals triangular, pointed.

Brown above, little paler marginally. Tail with dorsal and anal cutaneous folds dusky brown. Under surface of body whitish.

India, Burma, Malay Peninsula, Pinang, Singapore, East Indies, Cochinchina, China, Japan. The figure of Müller and Henle agrees very well with my materials. Garman says with age "scattered tubercles in the vertebral series. Large individuals have a more or less complete median series, and have the tail roughened by small spines."

U.S.N.M. No. 50733. Onomichi, Bingo, Japan. Jordan and Snyder. Section of interocular region of skin, width, 66 mm.

U.S.N.M. No. 75871 and 75872. Japan ? P. L. Jouy. Length, 190–328 mm.

U.S.N.M. No. 75870. Japan ? P. L. Jouy. Length, 560 mm.

U.S.N.M. No. 51358. Kobe, Japan. Jordan and Snyder. Length, 730 mm.

DASYATIS MICROPS (Annandale)

Trygon microps Annandale, Rec. Indian Mus., vol. 2, p. 393, pl. 27, 1908 (type locality: Bengal Bay off Chittagong, in 17 fathoms); Mem. Indian Mus., vol. 2, p. 26, text fig. 1, pl. 2, fig. 3 (denticles), pl. 3, fig. 1 (mouth), pl. 4, fig. 1, 1909 (types; off Orissa).

Dasybatus microps Garman, Mem. Mus. Comp. Zool., vol. 36, p. 381, 1913 (copied).

Snout 3½ to 4½ in disk length, greater than interorbital, rounded, with small terminal projection covered with enlarged denticles; eyes very small, little prominent; mouth large, upper jaw slightly undulated, lower not undulate; coarsely digitate cutaneous flap hanging down from mouth roof; usually 5 short fingerlike processes on mouth floor, 3 in center joined together at base and one at either side; teeth white, transverse ridge very conspicuous in unworn teeth, part anterior slightly concave and considerably greater in area than that posterior, which convex.

Skin soft and delicate, without enlarged tubercles on disk, bearing numerous minute, spiny denticles, all with stellate bases; denticles larger on snout tip and region around eyes and spiracles than elsewhere, sometimes extending to ventral surface at pectoral edges. Tail toward base with much larger denticles, which largest on sides and only bear very short stellate spines on ventral surface; terminal part densely clothed with denticles similar to but smaller than those on sides of basal part.

Tail without cutaneous fins, not longer than disk, with broad flat basal part about half long as disk and slender cylindrical terminal part of about same length, with single massive spine at junction of 2 parts; very low ridge on ventral surface of terminal part; pectorals form rhombic disk, length little over 1¼ in width, outer angles rather greater than right angles.

White, dorsal surface of disk suffused with rose pink, without definite markings. Eyes dark. Tail gray above, becomes darker terminally. Length, 3,170 mm. (Annandale.)

India.

DASYATIS JENKINSII (Annandale)

Trygon jenkinsii ANNANDALE, Mem. Indian Mus., vol. 2, p. 28, text fig. 4-a, 1909 (type locality: off Ganjam coast, India, 23–27 fathoms).

Dasybatus jenkinsii GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 378, 1913 (copied).

Head to hind spiracle edge 3¾ in disk length. Snout 1⅗ in head to hind spiracle edge, as seen above snout sharply pointed in broad obtuse angle, not much produced; orbit 4⅛, 2⅞ in snout, 2⅞ in interorbital; mouth jaws feebly undulated; teeth white, practically uniform in size, each with low transverse ridge situated near hind edge and with distinct transverse depression in front; papillae on mouth floor 4, 2 median rather well separated; interorbital 1½ in head to hind spiracle edge. Spiracles close behind eye, subequal with orbit.

Skin fairly tough. Few enlarged rounded denticles in scapular region, followed posteriorly by single row of stout, short, retroverted spines with flat bases, row extending on tail to base of anterior spine; middle of back occupied by pavement of small, flat, round scales, gradually smaller towards periphery. Tail covered by small bluntly spinous tubercles. Pectorals and ventrals naked.

Tail cylindrical, without folds, not much longer than disk width, sometimes with 2 long, slender spines; pectorals form broad subquadrangular disk, length 1⅕ in its width which greatest just behind spiracles, outer angles rounded, front edges linear, hind edges convex.

Dorsal surface reddish olive, paler at edges of fins, without definite markings. Tail dark gray, mottled on ventral surface with brown and white at base. Ventral surface of disk dead creamy white. Length, 192 mm. (Annandale.)

India. According to Garman possibly a variety of *Dasyatis uarnak.*

DASYATIS PONAPENSIS (Günther)

Trypon ponapensis GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 493, 1910 (type locality: Kubary, Ponape, Carolines).

Dasybatus ponapensis GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 380, 1913 (copied).

Dasyatis ponapensis FOWLER, Mem. Bishop Mus., vol. 10, p. 24, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 50, 1930 (reference).

Head to hind edge of spiracle 8⅖ in total length. Snout 1⅘ in head to hind spiracle edge, as seen above broadly rounded with very slight prominence; eye 4, 2⅖ in snout, wide as orbital protrusion, 1½ in firm interorbital, 3⅔ across entire interorbital width; dental plates undulated; 4 papillae on mouth floor, as pair medially behind lower dental plate and 1 each side near mouth angle; internarial 2$\frac{1}{10}$ in preoral length, flap with entire edge; interorbital 1⅛ in head to hind spiracle edge. Interspiracle space 1¼, spiracle length little greater than orbit.

Skin smooth.

Tail long, whiplike, strong basally, tapering, without dermal folds, spine inserted little before first fifth its length, 1½ in head to hind spiracle edge; pectorals form circular disk, width slightly less than length, which 1⅘ in tail.

Uniform. Size not given, a young female. (Günther.)

Micronesia. Probably the young of the very variable *Dasyatis imbricatus*, though thought by Günther to differ in the presence of 4 papillae on the floor of the mouth.

DASYATIS UYLENBURGI Giltay

Dasyatis uylenburgi GILTAY, Mem. Mus. Roy. Nat. Hist. Belg., ser. 5, vol. 3, p. 13, figs. 3–6, 1933 (type locality; Poeloe Endoe, Aru Islands).

Disk width very slightly less than its length; snout 3⅔ in disk length to hind pectoral end; eye 5⅔ in snout, 3 in interorbital; mouth small, 2½ in preoral length; upper jaw curved and well undulated, upper teeth 33, lower 27, small, white, subtriangular, pointed; buccal papillae 3, two external ones much longer than median; interorbital 2 in snout; spiracle little longer than eye.

Scales of back form regular design from interorbital to base of tail, cordiform; on median line of tail row of 5 spiniform, lanceolate scutes.

Tail short, 1½ times longer than disk, armed with barbed spine above; upper and lower ridges little distinct, obsolete.

Disk above uniformly brown, paler toward edges. Below white.

Length of disk, 180 mm., disk width, 190 mm., tail, 280 mm. (Giltay.)

Aru Islands. Said to differ from *Dasyatis imbricatus* in dentition, the 3 buccal papillae inside the mouth, and the long continuous paved area of scutes on the back.

DASYATIS MARGINATUS (Blyth)

Trygon marginatus BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 38, 1860 (type locality: Lower Bengal).—DAY, Fishes of India, pt. 4, p. 738, 1878 (Blyth's example); Fauna British India, Fishes, vol. 1, p. 54, 1889.—ANNANDALE, Mem. Indian Mus., vol. 2, p. 30, text fig. 5, pl. 3, fig. 11 (mouth), 1909 (off Burma and Ganjam, 24 fathoms).—PEARSON, Ceylon Administr. Rep. 1915–18, p. F16.

Trygon (Himantura) marginatus DUMÉRIL, Nat. Hist. Elasmobr., vol. 1, p. 588, 1865 (Calcutta).

Dasybatus marginatus GARMAN, Mem. Mus., Comp. Zool., vol. 36, p. 378, 1913 (Burma, Ganjam, India).

Trygon atrocissimus BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 39, 1860 (type locality: Probably Indian Ocean (tail with spine).)

Head to hind spiracle edge 9¾ in total length. Snout 1⅓ in head to hind spiracle edge, as seen above front profile obtusely rounded sometimes with short terminal projection; eye small, about 12 in head, 8 in snout, 5⅓ in interorbital; mouth rather small, lower jaw more distinctly undulated than upper, which nearly straight; teeth faintly tinged brown, unworn ones distinctly but minutely ridged longitudinally, strong transverse ridge with well-marked concavity on surface in front; two short papillae on mouth floor, one near each angle; interorbital 1⅞ in head to hind spiracle edge. Spiracle nearly twice large as eye, close behind eye, interspiracle width 1½ in head.

Skin delicate. Head and center of back covered with close-set, rounded, nearly flat denticles, on tail intermixed with stellate spines. On back denticles gradually smaller from middle outward and not forming clearly defined design; externally each side some with stellate bases, this marked on those on pectorals where somewhat arranged in longitudinal lines; extend to margin and sometimes over it on ventral surface.

Tail without folds and with single large caudal spine; pectorals form broad quadrangular disk, length 1⅓ its width or 2⅙ in tail, outer angles somewhat narrowly rounded, front edges nearly linear and hind edges only slightly convex; ventrals small.

Above gray, with distinct blackish tint and without any tinge of brown. Male with series of livid bluish marks running round disk at some little distance from margin. Tail blackish. Ventral surface white, with broad blackish margin laterally and posteriorly, sometimes indistinct. Length, 342 mm. (Annandale.)

India, Burma.

DASYATIS IMBRICATUS (Schneider)

Raja imbricata Schneider, Syst. Ichth. Bloch, p. 366, 1801 (type locality: Coromandel).

Trygonobatus imbricatus Blainville, Bull. Soc. Philom. Paris, vol. 8, p. 112, 1816 (name only).

Trygon imbricata Cuvier, Règne Animal, vol. 2, p. 136, 1817 (reference).—Müller and Henle, Syst. Beschreib. Plagiostomen, p. 164, 1841 (Coromandel; Java).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1407, 1849 (Pinang Sea, Singapore, Malay Peninsula).—Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Bangcallang and Kammal).—Gray, List fish British Museum, p. 119, 1851 (reference).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 63, 1852 (Coromandel, Bengal); (Bengal), vol. 25, p. 9, 1853 [on *Isacurrah tenkee* Russell, Fishes of Coromandel, vol. 1, p. 3, pl. 4 (Vizagapatam), p. 24 (on McClelland), p. 82, 1803 (reference)].—Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 40, 1860 (Calcutta).—Günther, Cat. Fishes British Mus., vol. 8, p. 481, 1870 (compiled).—Day, Fishes of India, pt. 4, p. 739, 1878; Fauna Brit. India, Fishes, vol. 1, p. 52, 1889.—Annandale, Mem. Indian Mus., vol. 2, p. 32, pl. 3, fig. 5, text fig. 6, 1909 (Puri on Orissa coasts).—Pearson, Ceylon Administr. Rep., 1912–13, p. E13.—Malpas, Ceylon Administr. Rep., 1921, p. E5.

Trygon (*Trygon*) *imbricatus* Duméril, Nat. Hist. Elasmobr., vol. 1, p. 606, 1865 (Coromandel; Pondicherry).

Dasybatus imbricatus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 379, 1913 (East Indies).—Suvatti, Index Fish. Siam, p. 6, 1937 (Laem Sing; Sriracha; Chonburi; Trat).

Dasybatus (*Himanturus*) *imbricatus* Chabanaud, Service Océanogr. Pêches Indo-Chine, 1e note, p. 6, 1926 (Gulf of Siam).

Dasyatis imbricatus Fowler, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 102, 1928 (Bombay); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Indian Ocean); Hong Kong Nat., vol. 1, p. 179, 1930 (Indian Ocean); Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 89, fig. 6, 1935 (Bangkok; Sriracha; Paknam); vol. 89, p. 128, 1937 (Paknam); List Fish. Malaya, p. 16, 1938 (reference).

? *Trygonobatus dorsatus* Blainville, Bull. Soc. Philomath. Paris, vol. 8, p. 112, 1816 (name only).

Pastinaca dorsalis Swainson, Nat. Hist. Animals, Fishes, vol. 2, p. 319, 1839 (on *Isacurrah tenkee* Russell).

? *Raia fluviatilis* Buchanan-Hamilton, Fishes of Ganges, p. 1, 1822 (type locality: Kampur, Ganges River).

Trygon immunis Bennett, Life of Raffles, p. 694, 1830 (type locality: Sumatra).

Pastinaca brevicauda Swainson, Nat. Hist. Animals, vol. 2, p. 319, 1839 (on *Tenkee shindraki* Russell, Fishes of Coromandel, vol. 1, p. 3, pl. 5, 1803, (type locality: Vizagapatam).

Dasybatus brevicauda Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 460 (Baram, North Borneo).

Trygon walga Müller and Henle, Syst. Beschr. Plagiostomen, p. 159 (not fig.) 1841 (type locality: India, Red Sea).—Gray, List fish British Museum, p. 117, 1851 (Singapore).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 67, 1852 (Batavia, Samarang); (Bengal), vol. 25, p. 82, 1853 (reference); Nat. Tijds. Nederland. Indië, vol. 21, p. 136, 1860 (Muntok, Banka).—Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 40, 1860 (Calcutta).—Kner, Reise *Novara*, Fische, p. 420, 1865 (Singapore).—Günther, Cat. Fishes British Mus., vol. 8, p. 475, 1870 (Bengal Bay, East Indies, Pinang, Java).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Singapore).—Day, Fishes of India, pt. 4, p. 738, pl. 194, fig. 3, 1878.—Peters, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).—Sauvage, Bull. Soc. Philom. Paris, ser. 7, vol. 5, p. 104, 1881 (Swatow).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 19, 1888 (Bombay, Madras, Singapore).—Day, Fauna British India, Fishes, vol. 1, p. 55, 1889.—Bartlett, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Buntal).—Steindachner, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 161, 1907 (Gischin).—Lloyd, Rec. Indian Mus., vol. 1, p. 220 1907 (Akyab).—Pellegrin, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 4, 1912 (no locality).—Southwell, Ceylon Administr. Rep., 1912–13, pp. E43, E45, E47 description, E48, E49.—Pearson, Ceylon Administr. Rep., 1914, p. E4; 1915–18, pp. F9, F10, F11, F13.—Malpas, Ceylon Administr. Rep., 1921, p. E8.—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 625, 1926 (Sarawak).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).—Tirant, Service Océanogr. Pêches Indo-Chine, 6e note, pp. 32, 175 (Hué), p. 77 (Saigon-Thaudaumot), 1929.

Trygon (*Himantura*) *walga* Duméril, Hist. Nat. Elasmobr., vol. 1, p. 589, 1865 (Sea of the Indies, Ganges mouth, Java).

Dasyatis walga Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 57 (copied).

Trygon ehindrakee (Cuvier) BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 9, 1853 (on *Tenkee shindraki* Russell).

Trygon heterurus BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 67, 1852 (type locality: Batavia); Nat. Tijds. Nederland. Indië, vol. 9, p. 395, 1855 (North Pasuruan, Java); vol. 20, pp. 238, 447, 1859–60 (Singapore).

Trygon (*Himantura*) *heterurus* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 591, 1865 (compiled).

Trygon polylepis BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 73, 1852 (type locality: Batavia); Versl. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 475, 1870 (Ceylon).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 680, 1871 (Red Sea).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 447, 1876 (Mauritius; Seychelles).—BARTLETT, Sarawak Gaz., vol. 26, No. 366, p. 134, 1896 (Buntal).

Trygon (*Himantura*) *polylepis* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 590, 1865 (compiled).

Trigon polylepis SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.

Trygon dadong BLEEKER, Nat. Tijds. Nederland, Indië, vol. 10, p. (348) 355, 1856 (type locality: Rio, Bintang).

Trygon (*Himantura*) *dadong* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 591, 1865 (Bintang).

Leiobatus dadong BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).

Trygon nuda GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 476, 1870 (type locality: Singapore, India).

Trygon nudus MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 408, 1876 (Singapore).

Himantura nuda JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 42, 1901 ("Japan").

Dasyatis nudus FOWLER, List Fish. Malaya, p. 16, 1938 (reference).

Raja obtusa (Ehrenberg) KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 680, 1871 [type locality: Red Sea (name in synonymy)].

Snout produced, sharp angular point, slightly longer than preoral or nearly double interorbital; eye 3⅗ in interorbital; mouth width 3 in preoral length, little undulate; 2 oral papillae; teeth in about 32 rows in each jaw; interorbital 1⅞ in snout, slightly depressed medially. Spiracle large as eye.

Interorbital, short space before eyes, cranium and middle of back broadly covered with minute rough plates or tubercles; at disk center small spine and slight enlarged vertebral row to tail where about 9 down to caudal spines, posterior of which larger and 2¼ in snout.

Tail without membranes; disk nearly wide as long, front edges little concave, broadly rounded at angles and behind; claspers moderate.

Uniform brown above, whitish below.

Red Sea, Mauritius, Seychelles, India, Ceylon, Malay Peninsula, Pinang, Singapore, East Indies, Indo China, China.

1 example. A.N.S.P. Bombay, India. Dr. F. Hallberg. Disk to hind ventral ends, 238 mm., tail, 285 mm., disk width, 225 mm.

DASYATIS GRANULATUS (Macleay)

Trygon granulata MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, pt. 4, p. 598, 1883 (type locality: New Guinea).

Himantura granulata WHITLEY, Rec. Australian Mus. vol. 16, p. 211, figs. 1–2, 1928 (type: Vanikoro, Santa Cruz Group); Journ. Pan-Pacific Res. Inst., vol. 3, No. 1, p. 11, 1928 (Santa Cruz Group).

Dasyatis granulatus FOWLER, Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).

Dasyatis gerrardi (not Gray) GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 377, 1913 (part).—FOWLER, Mem. Bishop Mus., vol. 10, p. 24, 1928 (part); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Head to hind spiracle edge 7¼ in total length. Snout 1½ in head to hind spiracle edge as seen above meets at broadly obtuse angle; eye 5, 3 in snout, 2½ in interorbital; mouth width 3 in head to first gill opening; teeth lozenge-shaped, close-set in oblique series, each with cusp over its long axis; upper buccal flap fringed with about 21 points; 2 fairly large buccal papillae with rounded but somewhat frayed edges; interorbital 2 in head to hind spiracle edge. Spiracle close behind eye, little larger than eye.

Head, back, median line of tail to root of caudal spine evenly covered with thorny granules, which largest near median line, not forming median row or differing amongst themselves except in size. Similar minute granules over snout and on sides of pectorals. Scattered prickles stud long tail, smaller and disappearing before tip. Ventrals, under surface of disk, sides and lower surface of tail basally, smooth.

Tail filamentous (spine removed), without folds; pectorals form subcircular disk, width slightly less than its length, which 1½ in tail, outer angles widely rounded, hind edges convex and hind angles obtusely rounded; ventrals slightly longer than interorbital width.

Brown, lighter below. Margins of ventral surface smoky brown. At least 9 ill-defined, crescentic, brownish markings arched along middle of each pectoral, largely faded. Length, 865 mm. (Whitley.)

East Indies, Melanesia. The above is largely from Whitley's redescription and figure of Macleay's holotype of *Trygon granulata*. He also describes and figures a smaller one 751 mm. long from the Santa Cruz Group with "no ocelli" and therefore evidently without the crescentic markings on the pectorals in the holotype.

Genus UROGYMNUS Müller and Henle

Urogymnus MÜLLER and HENLE, Arch. Naturg., 1837, p. 434. (Type, *Raja asperrima* Schneider, virtually. *Urogymnus* Müller and Henle proposed to replace *Gymnura* Müller and Henle.)

Anacanthus (not Gray 1831, Audinet-Serville 1932) (Ehrenberg) HOVEN, Handb. Dierk., vol. 2, p. 179, 1833. (Type, *Raja africana* Schneider.)

Gymnura (not Kuhl 1824) MÜLLER and HENLE, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 117. (Type, *Raja asperrima* Schneider, monotypic.)

Rhachinotus (not Gray 1831 or Serville 1832) CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 404, 1849. (Type, *Raja africana* Schneider, monotypic. *Rhachinotus* Cantor proposed to replace *Anacanthus* Müller and Henle.)

Body disciform, partly circular. Tail long, slender, tapers, without spine or fins other than narrow cutaneous subcaudal at some stages. No rostral cartilage. Mouth undulate, transverse. Teeth tesselated, flattened, rhomboid. Spiracles large, close behind eyes. Scales tubercular, with broad rounded to polygonal bases, varying in shape, size, and numbers with age. No dorsal. Pectorals meet at front of disk, margins and angles rounded. Ventrals short, wide.

UROGYMNUS AFRICANUS (Schneider)

Raja africana SCHNEIDER, Syst. Ichth. Bloch, p. 367, 1801 (type locality: Guinea).

Anacanthus africanus MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 157, 1841 (Red Sea; Guinea).

Rhachinotus africanus CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1404, 1849 (Pinang).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 65, 1852 (Red Sea; Guinea); Nat. Tijdschr. Nederland, Indië, vol. 4, p. 514, 1853 (Batavia).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 374, 1913 (Indian Ocean; East Indies).—CHEVEY, Inst. Oceanogr. Indochine, 19ᵉ note, p. 7, 1932 (Cochinchina).

Urogymnus africanus DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 581, 1865 (copied).—OGILBY, Mem. Queensland Mus., vol. 5, p. 88, 1916 (Darnley Island).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference); List Fish. Malaya, p. 18 (246), 1938 (reference).

Raja asperrima SCHNEIDER, Syst. Ichth. Bloch, p. 367, 1801 (type locality: Indian Ocean, Bombay).

Raja asperrimus MÜLLER and HENLE, Ann. Mag. Nat. Hist. Charlesworth, vol. 2, p. 90, 1838 (name).

Urogymnus asperrimus GRAY, List fish British Museum, p. 115, 1851 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 580, 1865 (Seychelles).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 471, 1870 (India, Pinang, Africa, Seychelles).—JOUAN, Mém. Soc. Imp. Sci. Nat. Cherbourg, ser. 2, vol. 5, p. 106, 1870 (Seychelles).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 684, 1871 (Red Sea).—DAY, Fishes of India, pt. 4, p. 736, pl. 195, fig. 1, 1878 (Madras Museum).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 312, 1880 (Cape York); vol. 6, p. 376, 1881 (Cape York).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 18, 1888 (Kingsmill Islands).—DAY, Fauna Brit. India, Fishes, vol. 1, p. 48, fig. 20, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, 1903, p. 193, 1904 (Kuala Langat).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 37, pl. 3, fig. 8 (mouth), pl. 5, figs. 2–2a, 1909 (off Chittagong Island); vol. 3, p. 3, 1910.—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E47 (descriptive) E49.—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 602, fig. 123, 1913 (Lumu-Lumu, Borneo Bank).—PEARSON, Ceylon, Administr. Rep. 1915–18, p. F13.—TIRANT, Service Océanogr. Pêches Indo-

Chine, 6ᵉ note, p. 76, 1929 (Cholon).—FOWLER, Mem. Bishop Mus., vol. 11, no. 5, p. 314, 1931 (reference).—SUVATTI, Index Fish. Siam, p. 5, 1937 (Ko-Chang).

Urogymus asperrimus PEARSON, Ceylon Administr. Rep., 1915–18, p. F12 (error).

Anacanthus asperrimus MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 157, pl. 60, figs. 5–7, 1841 (India).

Urogymnus rhombeus KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 683 1871 (type locality: Koseir, Red Sea).

Urogymnus laevoir ANNANDALE, Mem. Indian Mus., vol. 2, p. 37, 1909 (type locality: Malpe, South Canara on Malabar Coast).

Head to hind spiracle edge 8⅖ in total length. Snout 2 in head to hind spiracle edge; eye 5, 2½ in snout, 4 in interorbital; mouth waved, inner buccal fold fringed, 3 to 5 oral papillae on mouth floor; teeth blunt, broader than long, in 48 rows; front nasal valves confluent, fringed posteriorly; interorbital 1⅔ in head to hind spiracle edge. Spiracle close behind and larger than eye, interspiracle 1¼ in head to hind spiracle edge.

Scales tubercular, unequal, more or less striated, with rounded bases where not in contact, with polygonal bases where crowded and with cusps short to long, acute, blunt or rounded to depressed and shovel-shaped.

Tail long, tapering, with or without narrow fold below according to age; pectorals form suboval disk, more pointed backward and with slight prominence at snout end, width 1⅙ in its length, which equals tail or 2 in tail length; ventrals well covered by pectorals.

Yellowish to whitish on tubercles, skin dark brown where exposed. (Day; Garman.)

Red Sea, Arabia, East Africa, Seychelles, India, Ceylon, Malay Peninsula, Pinang, East Indies, Indo China, Queensland, Melanesia. According to Annandale the disk length reaches 1,125 mm.

Genus UROLOPHUS Müller and Henle

Urolophus MÜLLER and HENLE, Sitz. Ber. Akad. Wiss., Berlin, p. 17, 1837. (Type, *Raja cruciata* Lacépède.)

Leiobatus (not Walbaum or Rafinesque) BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816. (Type, *Leiobatus sloani* Blainville, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 95, 1917.)

Trygonoptera MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 174, 1841. (Type, *Raja testacea* (Banks) Müller and Henle, monotypic.)

Disk partly quadrangular, narrower behind, front edges waved, meeting at blunt angle in front, outer and hinder angles rounded. Tail shorter than body, stout, with spine. Snout little produced. Papillae at mouth floor. A small dorsal variably present or absent. Caudal short, moderately deep, rounded behind. Ventrals short, broad, front and hind rays subequal, directed back.

ANALYSIS OF SPECIES

- a^1. Urolophus. Tail short, length less than half its space from mouth.
  - b^1. No tubercle on shoulder girdle.
    - c^1. Back uniform brown ---------- **aurantiacus**
    - c^2. Back with dark vertebral streak ---------- **sufflavus**
    - c^3. Back with dark transverse and longitudinal markings ---------- **cruciatus**
  - b^2. Back spinose, tubercle on shoulder girdle; brown with more or less scattered round dark spots ---------- **armatus**
- a^2. Trygonoptera. Tail longer than its space from mouth.
  - d^1. Hind edge of internasal valve with narrow fringe or lobules; nostrils without broad hind lobes.
    - e^1. Papillae behind lower jaw numerous, close together.
      - f^1. Snout would form right angle; back pale brown, closely specked with small brownish white dots ---------- **bucculentus**
      - f^2. Snout would form very blunt angle; back dark brown, with numerous small or pale spots ---------- **javanicus**
    - e^2. Papillae behind lower jaw fewer, widely spaced.
      - g^1. Disk slightly broader than long; back uniform ---------- **viridis**
      - g^2. Disk much wider than long.
        - h^1. Back uniform ---------- **kaianus**
        - h^2. Back with dark cross bars ---------- **expansus**
  - d^2. Hind edge of internarial valves broadly fringed; nostrils with broad posterior lobes ---------- **testaceus**

Subgenus UROLOPHUS Müller and Henle

UROLOPHUS AURANTIACUS Müller and Henle

Urolophus aurantiacus Müller and Henle, Syst. Beschr. Plagiostomen, p. 173, pl. 56, 1841 (type locality: Gotto Island, southwest coast of Japan).—Schlegel, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 307, 1850.—Gray, List fish British Museum, p. 126, 1851 (reference).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Gotto; China); Nederland. Tijdschr. Dierk., vol. 2, p. 68, 1865 (reference).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

Pastinaca jeinorii (Bürger) Müller and Henle, Syst. Beschr. Plagiostomen, p. 173, 1841 (name in synonymy).

Urolophus cruciatus (not Lacépède) Duméril, Hist. Nat. Elasmobr., vol. 1, p. 626, 1865 (part).

Urolophus fuscus Garman, Proc. U. S. Nat. Mus., vol. 8, p. 41, 1865 (type locality: East coast Niphon, Japan).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 657, 1903 (Tokyo, Kobe, Hiroshima, Hakata, Wakanoura).—Smith and Pope, Proc. U. S. Nat. Mus., vol. 31, p. 460, 1906 (Kagoshima).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 640, 1908 (Japan).—Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Tokyo).—Jordan and Thompson, Mem. Carnegie Mus., vol. 6, p. 208, 1914 (Osaka).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus., Vertebrata, p. 187, 1920 (Misaki).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 115, 1925 (Yokohama, Toba, Misaki, Kagoshima Bay).—Mori, Journ. Pan Pacific Res. Inst., vol 3, p. 3, 1928 (Fusan, Korea).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (Japan).—Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 14, 1931 (Misaki).

Urolophus tullbergi NYSTRÖM, Bihang Svenska Vet.-Akad. Handl., vol. 13, pp. 4, 53, 1887 (type locality: Nagasaki).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).

Depth 10 to 13¾ to end of caudal; head 4 to 4⅞; disk length 1 to 1⅕ in its width; tail 1⅓ to 1½ in disk length. Snout 1½ to 1¾ in head, forms narrow triangular point in front; eye 4¼ to 5¾, 2⅗ to 3⅔ in snout, 2⅓ to 2⅘ in interorbital; dentary width 2½ to 3¼ in head; teeth in 28 to 30 rows in jaws, each with rather narrow triangular cusp; upper lip with fringed edge, lower with rather large pleats; nostrils small, internarial width 1⅓ in dentary; interorbital 1¼ to 1⅘ in head. Gill openings small, equidistant, last shortest. Spiracles quite large, deep, wide, equal about 1⅔ eye diameters.

Skin smooth. Caudal spine 1¾ to 2⅖ in head.

No dorsal or anal; caudal moderately deep and rounded, its greatest expansion about equals spiracle; pectorals form partly quadrangular disk, broadly rounded; ventrals broad, obtuse; claspers flattened though robust, compressed, about half head length.

Back and above uniform brown. Below whitish, outer edges of disk broadly brownish.

Japan, Korea. I follow McCulloch's suggestion in placing *Urolophus fuscus* Garman as a synonym of the present species.

U.S.N.M. No. 50735. Wakanoura, Japan. Jordan and Snyder. Length, 128 to 260 mm. 2 examples.

U.S.N.M. No. 71829. Tokyo market. *Albatross* collection 1906. Length, 350 mm.

UROLOPHUS SUFFLAVUS Whitley

Urolophus sufflavus WHITLEY, Australian Zool., vol. 5, p. 354, 1929 (on *Urolophus aurantiacus* McCulloch, 1916).

Urolophus cruciatus (not Lacépède) WAITE, Mem. Australian Mus., vol. 4, pt. 1, p. 43, 1899 (Shoalhaven Bight and Jervis Bay); Mem. New South Wales Nat. Club, No. 2, p. 10, 1904.

Urolophus aurantiacus (not Müller and Henle) McCULLOCH, Biol. Res. *Endeavour*, vol. 4, pt. 4, p. 172, pl. 49, 1916 (off Manning River to Port Kemblon, New South Wales, in 20–84 fathoms); Fishes of New South Wales, ed. 2, p. 12, pl. 3, fig. 39a, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference; part).

Head to hind spiracle edge 5⅕ in total length. Snout 1⅖ in head to hind spiracle edge; eye 5⅓, 3¾ in snout, 2½ in interorbital; mouth width 2⅛ in preoral length; teeth pavementlike in female, each with elongate flattened spine in male; median papilla behind lower jaw, which subdivided into 2 to 4 lobes, another simple or bifurcate one each side and one near each angle of jaws; internarial 2⅘ in preoral length, hind outer angles of lobe separated from hinder margin as small rounded tubercles, fimbriate hind edge little sinuous; nostrils large, confluent with mouth and separated by thick median frenum; interorbital 2 in head to hind spiracle edge. Spiracle along and behind eye, about equals 1⅗ eye diameters.

Tail 1½ in disk length, width between ventrals subequal with mouth, spine 1⅗ in head to hind spiracle edge, inserted about first ⅖ in tail below disk; caudal begins above directly behind spine end, below middle of its length on lower surface and width subequal variably with internarial; pectorals form more or less rounded disk, front margins almost straight from snout to broadly rounded outer angles, hind lateral edges convex, form obtuse angles with inner edges; ventral edges convex, angles rounded.

Rich ochreous yellow above when fresh, sometimes stained with pink toward disk edges. Indefinite brown median dorsal stripe may extend from eyes to dorsal spine. White below, purplish toward edges. Width, 387 mm. (McCulloch.)

New South Wales. Apparently differs from the Japanese *Urolophus aurantiacus* in the dark median dorsal stripe.

UROLOPHUS CRUCIATUS (Lacépède)

Raja cruciata Lacépède, Ann. Mus. Hist. Nat. Paris, vol. 4, pp. 201, 210, pl. 55, fig. 2, 1804 [type locality: New Holland (Australia)].—Müller and Henle, Mag. Nat. Hist. Charlesworth, vol. 2, p. 90, 1836 (name only).

Leiobatus cruciatus Blainville, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816 (name only).

Urolophus cruciatus Duméril, Hist. Nat. Elasmobr., vol. 1, p. 626, 1865 (Australia, Port Western, Tasmania).—Günther, Cat. Fishes British Mus., vol. 8, p. 485, 1870 (Port Arthur).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 378, 1881 (Port Arthur).—Johnston, Proc. Roy. Soc. Tasmania, 1882, p. 141, 1883; 1890, p. 39, 1891.—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 21, 1888 (Port Jackson).—McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 14, 1911 (Bass Strait).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 408, 1913 (Hobart, Tasmania).—Waite and McCulloch, Trans. Roy. Soc. South Australia, vol. 39, p. 460, 1915 (Great Australian Bight, in 22–140 fathoms).—McCulloch, Biol. Res. *Endeavour*, vol. 4, pt. 4, p. 171, 1916 (Bass Strait, off Port Davey, Mainwaring Cove, Bay of Fires, Tasmania; Investigator Group, South Australia; in 37–88 meters).—Waite, Rec. South Australian Mus., vol. 2, p. 32, fig. 45, 1921.—Fowler, Proc. 4th (1929) Pacific Sci. Congr. Java, p. 503, 1930 (reference).

Urolophus ephippiatus Richardson, Voy. *Erebus* and *Terror*, Fishes, p. 35, pl. 24, 1846 (type locality: Storm Bay, Van Diemens Land).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 627, 1865 (copied).

Trygonobatus ephippiatus Gray, List fish British Mus., p. 126, 1851 (reference).

Depth 9⅞ to 13⅕ to end of caudal; head 4⅔ to 4$\frac{9}{10}$; disk length 1 to 1$\frac{1}{10}$ in its width; tail 1¼ to 1⅔ in disk length. Snout 1½ to 1⅗ in head, forms broad, obtuse point for very wide angle of front profile line; eye 5⅖ to 6½, 4 to 4¼ in snout, 2⅗ to 3 in interorbital; dentary width 4⅘ in head; teeth in 18 to 20 rows in jaws, wider than long, with slight transverse concavity on crown; both lips with fringed edges; nostrils small, internarial width subequal with dentary width; interorbital 2⅕ to 2¼ in head, level. Gill openings small, subequal, equidistant, first and last shorter. Eye 1⅗ of large spiracle.

Skin smooth. Caudal with 2 spines, near end of tail, second longer or 1½ in head.

No dorsal or anal; caudal moderately deep, end rounded; pectorals form partly quadrangular disk, broadly rounded; ventrals broad, obtuse; claspers flattened though robust, obtusely conic, little less than total ventral length.

Uniform brownish above. Below whitish, outer portions of pectorals laterally, also of ventrals and all of caudal dusky.

New South Wales, Victoria, South Australia, Tasmania.

U.S.N.M. No. 39989. Port Jackson. Australian Museum. Length, 530 mm.
U.S.N.M. No. 39993. Port Jackson. Australian Museum. Length, 470 mm.
U.S.N.M. No. 40008. Port Jackson. Australian Museum. Length, 420 mm.

UROLOPHUS ARMATUS Müller and Henle

Urolophus armatus (Valenciennes) Müller and Henle, Syst. Beschr. Plagiostomen, p. 174, 1841 (type locality: New Ireland).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 628, 1865 (type).—Günther, Cat. Fishes British Mus., vol. 8, p. 485, 1870 (copied); Journ. Mus. Godeffroy, pt. 17, p. 495, 1910 (copied).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 407, 1913 (New Ireland).—Fowler, Mem. Bishop Mus., vol. 10, p. 25, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

Snout somewhat pointed and prominent; mouth waved; teeth flat.

Above with small asperities on rostral cartilages, along back and row on tail; strong tubercle on shoulder girdle.

Tail scarcely shorter than disk; pectorals form rhomboid, orbicular disk, rather wider than long, front edges rectilinear, angles and hind edges rounded.

Brown, with numerous round black spots. Belly white, edges darker. Length, 175 mm. (Müller and Henle; Duméril.)

New Ireland.

Subgenus TRYGONOPTERA Müller and Henle

UROLOPHUS BUCCULENTUS Macleay

Urolophus bucculentus Macleay, Proc. Linn. Soc. New South Wales, vol. 9, p. 172, 1884 (type locality: Outside Port Jackson, in 40–60 fathoms).—Ogilby, Cat. Fish. Australian Mus., vol. 1, p. 21, 1888 (types; off Barranjoey, Port Jackson).—Waite, Fisher. Rep. *Thetis*, p. 41, 1898 (Nelsons Bay at Port Stephens, New South Wales).—McCulloch, Biol. Res. *Endeavour*, vol. 4, pt. 4, p. 177, 1916 (Bass Straits, in 70–100 fathoms); McCulloch, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 466, pl. 41, figs. 1–3, 1921 (east of Botany Bay, in 60 fathoms); Fishes of New South Wales, ed. 2, p. 13, 1927.

Trygonoptera bucculenta Waite, Mem. Australian Mus., vol. 4, pt. 1, p. 44, pl. 5, text fig. 3 (preoral region), 1899 (New South Wales).—Stead, Fishes of Australia, p. 233, 1908.—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 410, 1913 (Australia).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Depth 13 to end of caudal fin (caudal fin broken); head 3⅚; disk length 1¼ its width; tail (end cut off) apparently about half disk length. Snout 1⅗ in head; eye 8, 5⅕ in snout, 3 in interorbital; dentary width 3⅖ in head; teeth in 24 rows in jaws, rhombic, crowns convex; nostrils large, internarial width equals dentary width; interorbital 2⅗ in head, generally depressed with median depression. Gill openings small, subequal, equidistant, last smallest. Spiracles large, twice eye, wide and deep.

Skin smooth. Caudal spine large, 4¾ in disk length.

Single small dorsal, length 2 in interorbital, close before base of caudal spine; caudal fin moderate; pectoral broad, front edge slightly emarginate, angles broadly convex; ventrals broad, half of head, ends obtuse.

Brown above, nearly uniform. Below whitish.

New South Wales. Garman gives the teeth in about 18 rows.

U.S.N.M. No. 39979. Port Jackson. Australian Museum. Length, 620 mm. to end of broken tail.

UROLOPHUS JAVANICUS (Martens)

Trygonoptera javanica Martens, Monatsb. Akad. Wiss. Berlin, p. 260, 1864 (type locality: Batavia).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 410, 1913 (Batavia).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Urolophus (*Trygonoptera*) *javanica* Günther, Cat. Fishes British Mus., vol. 8, p. 486, 1870 (copied).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Batavia).

Snout tip forms blunt angle, length twice mouth width; mouth weakly waved; teeth in pavement; 3 oral papillae. Spiracle close behind eye, pointed oval, edges entire, equals 1⅛ eye diameters.

Skin smooth.

Tail shorter than disk; spine on tail with 20 denticles each side; upper fold on tail wider behind than lower, which extends forward nearly opposite insertion of caudal spine; low half heart-shaped dorsal on tail; disk rounded, somewhat longer than wide, front edge weakly convex, hind edges strongly convex.

Above dark brown, with numerous small, pale or dark spots. Below pale reddish gray. Paired fins on under sides dark brown, colored with radiations. Length, 338 mm. (Martens.)

East Indies.

UROLOPHUS VIRIDIS McCulloch

Urolophus viridis McCulloch, Biol. Res. *Endeavour*, vol. 4, pt. 4, p. 176, pl. 51, 1916 (type locality: Off Sandon Bluffs, New South Wales to Bass Straits, Tasmania, in 10–100 fathoms); Fishes of New South Wales, ed. 2, p. 13, 1927.

Urotrygon viridis Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

Head to hind spiracle edge 4¾ in total length. Snout 1⅖ in head to hind spiracle edge, as seen above forms short broad triangular point; eye 5½, 4 in snout, 2½ in interorbital; mouth width 2⅕ in preoral length; median teeth with flattened cusps in male; fimbriate lip behind upper jaw, several variously disposed widely spaced papillae behind lower; internarial 2⅗ in preoral length, hind edge of valve with narrow lobulate border not fringed, outer hind angles form papillae in groove outside lips; nostrils without large free lobes, posteriorly overhanging mouth angle; interorbital 2⅖ in head to hind spiracle edge. Spiracle 3⅘, close along behind eye, inner edge without angular projection.

Tail depressed, 1⅓ in disk length, with well-developed fold each side, width between ventrals equals mouth width; spine inserted midway in tail, length 1⅘ in head to hind spiracle edge and sometimes with small anterior tubercle though no dorsal fin; caudal large, narrow, width ⅘ internarial, begins below hind part of spine on upper tail surface and extends forward as ridge to beneath front part of spine below; pectorals form rhomboidal disk, length 1⅕ its width, front edges slightly sinuous or almost straight with rounded outer angles, hind lateral edges little convex and junction with inner edges rounded; ventrals broad.

Light moss green above, extreme disk edges whitish. Iris golden. Lateral folds of tail and lower surfaces porcelain white, disk margins purplish. Back changes purplish brown after death, sometimes with broad blackish bar across interorbital and extending outward either side of eye. Width, 275 mm. (McCulloch.)

Tasmania, New South Wales.

UROLOPHUS KAIANUS Günther

Urolophus kaianus Günther, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 37, 1880 (type locality: Ki Islands, in 129 fathoms); vol. 22, p. 12, 1887 (reference).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 409, 1913 (copied).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

Snout not projecting.

Disk entirely smooth.

Tail little shorter than disk; no dorsal; disk much broader than long, front edges meet at very obtuse angle.

Uniform brownish. Length, 235 mm. (Günther.)

Ki Islands.

UROLOPHUS EXPANSUS McCulloch

Urolophus expansus McCulloch, Biol. Res. *Endeavour*, vol. 4, pt. 4, p. 178, fig. 2 (on p. 200), 1916 (type locality: Great Australian Bight, in 80–120 fathoms).—Waite, Rec. South Australian Mus., vol. 2, p. 33, fig. 47, 1921.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

Head to hind spiracle edge 4⅗ in total length. Snout 1½ in head to hind spiracle length, as seen above forms broad obtuse angle with very short point; eye 4½, 3 in snout, 1⅘ in interorbital; mouth width 2⅙; 2 or more papillae on median line of mouth behind lower jaw and several others widely spaced on either side; internarial 2⅕, hind outer angles of valve forms small rounded tubercles, hind edge fimbriate; nostrils large, narrow, without skinny lobe posteriorly; interorbital 2⅖. Spiracle along and behind eye, length 3⅔.

Tail depressed, with narrow keel on either side, length 1⅖ in disk length, width between ventrals subequal to that of mouth; spine inserted slightly before middle in tail length, 1½ in head to hind spiracle edge, without dorsal fin; caudal narrow, width less than internarial, begins below spine end on upper surface of tail and extends farther forward below; pectorals form widely rounded disk, length 1⅙ its width, front edges nearly straight to rounded outer angles and hind edges feebly convex and form obtuse angles at junctions with inner edges; ventrals subquadrangular, angles rounded.

Drab gray above, with 2 faint plumbeous cross bars on hinder part of head and oblique bar on either side of disk anteriorly. Width, 208 mm. (McCulloch.)

Great Australian Bight. Said to differ from *Urolophus kaianus* in the variegated color pattern, though as this is described from formalin material in the above species, this character requires confirmation.

UROLOPHUS TESTACEUS (Müller and Henle)

Trygonoptera testacea (Banks) Müller and Henle, Syst. Beschr. Plagiostomen, p. 174, pl. 56, 1841 [type locality: New Holland (Australia)].—Gray, List fish British Museum, p. 126, 1851 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 629, 1865 (Australia).—Waite, Mem. Australian Mus., vol. 4, p. 44, 1899 (New South Wales); Mem. New South Wales Nat. Club, No. 2, p. 10, 1904.—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1907, p. 419, 1908 (Victoria).—Stead, Edible Fishes New South Wales, p. 119, 1908; Fishes of Australia, p. 233, 1908.—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 410, 1913 (Australia).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Raja testacea (Banks) Müller and Henle, Syst. Beschr. Plagiostomen, p. 174, 1841 (name in synonymy).

Urolophus testaceus GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 486, 1870 (Sydney, Cape Upstart, Australia).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 315, 1880 (Cape Upstart, Port Jackson); vol. 6, p. 379, 1881 (Cape Upstart, Port Jackson).—OGILBY, Cat. Fishes New South Wales, 1886, p. 6; Cat. Fishes Australian Mus., vol. 1, p. 21, 1888 (Port Jackson, Port Phillip).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 46, 1890 (Port Phillip).—WAITE, Prelim. Rep. *Thetis* Exped., p. 40, 1898 (New South Wales).—TOSH, Marine Biol. Rep. Queensland, pl. 5, fig. 3, 1903 (Jumpin Pin).—OGILBY, Commerc. Fish Fisher. Queensland, 1915, p. 45 (Moreton Bay).—MCCULLOCH, Biol. Res. *Endeavour*, vol. 4, p. 174, pl. 50, 1916 (5 miles southwest of Fraser Island and Port Hacking in 15 fathoms).—OGILBY, Mem. Queensland Mus., vol. 5, p. 86, 1916 (Jumpin Pin, Cape Moreton, South Hill, Low Bluff, Double Island Point).—WAITE, Rec. South Australian Mus., vol. 2, p. 32, fig. 46, 1921.—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925.—MCCULLOCH, Fishes New South Wales, ed. 2, p. 12, pl. 3, fig. 39b, 1927.

Trygon testacea ZIETZ, Trans. Roy. Soc. South Australia, vol. 32, p. 292, 1908.

Trygon mulleri (not Castelnau) STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 53, pt. 1, p. 479, pl. 6, fig. 4 (young), 1866 (Port Jackson, Australia).

Trygon henlei (not Castelnau) STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 53, pt. 1, p. 479, pl. 6, fig. 4 (half grown), 1866 (Port Jackson).

Trygon australis (not Castelnau) STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 53, pt. 1, p. 480, pl. 7, 1866 (South Seas).

Head to hind spiracle edge 5⅔ in total length. Snout 1⅘ in head to hind spiracle edge, as seen above ends in very short obtuse point; eye 5¾, 4 in snout, 2¾ in interorbital; mouth width 2¼ in preoral length; teeth pavementlike, each with horizontal ridge in female, which elevated into obtuse spine in male; fimbriate lip behind upper jaw, median fimbriae largest; median bilobed papilla behind lower jaw, with 1 or 2 smaller each side; large free posterior nasal lobes overhanging mouth angles; internarial valve with broad free fringe of flattened tentacles, 14 on each side and outer external angles form small papillae hidden in mouth; internarial 2¾ in preoral length; interorbital 2 in head to hind spiracle edge. Spiracles along and behind eye, 4 in head to hind spiracle edge.

Tail depressed, without lateral folds, width between ventrals equals mouth width, length slightly less than disk length; caudal spine inserted about midway in tail length, 1⅓ in head to hind spiracle edge; dorsal long as eye, inserted close before caudal spine; caudal width ⅔ internarial, begins below hind fourth of caudal spine above and below extends forward nearly opposite dorsal; pectorals form rhomboidal disk, slightly broader than long front edges slightly sinuous or nearly straight from snout to broadly rounded outer angles, hind lateral edges convex, junction with inner edges rounded; ventrals broad.

Uniform cinnamon brown above, including eyes and tail. Extreme disk edges and caudal white. Below white with broad pale brown margin to pectorals and ventrals. Large examples darker brown, intramarginal parts of disk and caudal blackish. Width, 322 mm. (McCulloch.)

South Australia, Victoria New South Wales, Queensland.

Genus ANACANTHOBATIS Von Bonde and Swart

Anacanthobatis Von Bonde and Swart, Fisher. Marine Biol. Surv. South Africa, Rep., No. 3, 1922 errata slip, 1924. (Type, *Leiobatis marmoratus* Von Bonde and Swart, monotypic.)

Body and head form subcircular or partly rhomboid disk, little wider than body. Tail shorter than disk, tapering, without lateral folds or serrated spine. Pair of cutaneous flaps on mouth roof. Teeth in numerous rows, rounded, blunt or pointed. Skin smooth. No dorsal. Caudal very small. Ventrals notched, male with claspers.

ANACANTHOBATIS MARMORATUS (Von Bonde and Swart)

Leiobatis marmoratus Von Bonde and Swart, Fisher. Marine Biol. Surv. South Africa, Rep. No. 3, 1922, p. 18, pl. 23, 1924 (type locality: Natal coast in 160 fathoms).—Barnard, Ann. South African Mus., vol. 21, p. 79, 1925 (Natal coast).

? *Leiobatis dubius* Von Bonde and Swart, Fisher. Marine Biol. Surv. South Africa, Rep. No. 3, 1922, p. 19, 1924 (type locality: South Africa).

Head to hind spiracle edge 4¾ in total length. Snout 1¼ in head to hind spiracle edge, tip extends in short soft point; eye 5¾, 4⅔ in snout, 2⅖ in interorbital; mouth width 3 in preoral length to base of rostral filament; teeth small, blunt, in numerous rows, bases round; pair of arclike fringed flaps suspended inside mouth from top jaw, seen when mouth opened; nostrils large, close to mouth corners and continuous along very shallow nasoral grooves; 2 broad fringed flaps from inner nasal edges overhang mouth corners and grooves and outer nasal edges extended into 2 tubular, projecting, fringed flaps; interorbital 2⅗ in head to hind spiracle edge, concave. Spiracle close behind and slightly less than eye.

Above smooth, also below. Dark red papillalike projections of skin sparsely scattered over upper surface, including ventrals.

Tail rounded, thin, tapering, 1⅓ in disk length, no lateral folds; caudal rudimentary as small vertical thin fold or ridge; pectorals form subcircular disk in female, nearly quadrangular to rhombic in male, but very slightly broader than long; ventrals deeply notched, completely joined along inner edges with tail, infused outer edges serrated or denticulated.

Reddish brown, profusely mottled above with very small white spots, also scattered, pale, faintly brown ocelli. Length, 245 mm. (Von Bonde and Swart.)

South Africa. *Leiobatus dubius* based on an example but 102 mm., is said to have the same coloration as the above and its slight alleged structural characters are hardly distinctive.

Genus UROLOPHOIDES Soldatov and Lindberg

Urolophoides (Lindberg) Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 24, 1930. (Type, *Urolophoides giganteus* (Lindberg) Soldatov and Lindberg, orthotypic.)

Disk much broader than long, longer than tail. Greatest disk width opposite first ⅖ of disk length as measured from snout tip to hind edge of pectorals. Tail short, stout, tip blunt, length about ⅘ of disk length. Upper part of tail covered with numerous small prickles; 2 strong spines at base of tail and 2 at first basal third; 2 needles, large, near middle of tail. No dorsal or caudal fins. Vertical membranous fold on upper surface of tail. Skin of disk smooth, except hind parts of pectorals and ventrals.

Related to *Urolophus* in general appearance, but differs in the absence of the caudal fin. It resembles *Dasyatis* in the membranous caudal fold, but differs in its short, stout, nonwhiplike tail.

UROLOPHOIDES GIGANTEUS Soldatov and Lindberg

Urolophoides giganteus (Lindberg) Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 26, fig. 4, 1930 (type locality: Peter the Great Bay).—Taranetz, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 52, fig. 29, 1937.

Snout longer than interorbital width or space between spiracles, 3¾ in disk length as measured to hind pectoral edge. Eye ⅔ of spiracle, or 5½ in interorbital; combined eye and spiracle 2½ in snout. Mouth width 2 in preoral length. Ventrals extend but slightly behind hind ends of pectorals. Caudal needles slightly longer than interorbital space, very strong, serrated, inserted behind middle of tail.

Total length, 2,320 mm., disk width, 1,780 mm. (Soldatov and Lindberg.)

Peter the Great Bay.

Genus GYMNURA Kuhl

Gymnura Kuhl, Algemein Konst Letterbode, May, 1823, p. 316; Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824. (Type, *Raja micrura* Schneider, monotypic. Precludes *Gymnura* Lesson 1827, Horsfield and Vigors 1827, Nuttall 1834.)

Aetoplatea (Valenciennes) Müller and Henle, Syst. Beschr. Plagiostomen, p. 175, 1841. (Type, *Aetoplatea tentaculata* Müller and Henle, monotypic.)

Aëtoplatia Agassiz, Nomencl. Zool., Index, p. 10, 1846. (Type, *Aetoplatea tentaculata* Müller and Henle.)

Aetoplatia Scudder, Nomencl. Zool., Univers. Index, p. 8, 1882. (Type, *Aetoplatea tentaculata* Müller and Henle.)

Pteroplatea Müller and Henle, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 117. (Atypic.) (Type, *Raja altavela* Linnaeus, virtually affixed by Jordan and Gilbert, U. S. Nat. Mus., Bull. 16, p. 46, 1883.)

Planerocephalus Gratzianow, Zool. Anz., 1906, pp. 400, 403. (Type, *Planerocephalus elliott* Gratzianow=*Raja micrura* Schneider, monotypic.) (Monstrosity.)

Disk much wider than long, lozenge shaped, angles rounded, depressed and thin. Tail short, slender, with or without narrow dermal folds behind serrated spine. Head not prominent. Eyes small, prominent. Mouth wide, transverse, little arched; jaws slender. Teeth minute, numerous, in broad band, each tooth with wide base, with 1 to 3 sharp cusps. Nostrils wide, separated by broad isthmus; front valves confluent, crossing isthmus as narrow fold; posterior valves rudimentary. Spiracles large, close behind eyes. No dorsal fin. Pectorals wide, meeting in front of head. Ventrals small, narrow.

Temperate and tropical seas.

ANALYSIS OF SPECIES

a^1. Aetoplatea. Usually small dorsal fin at base of tail before caudal spine.
  b^1. Tentacle behind spiracle; tail less than half of body-------- tentaculata
  b^2. No tentacle behind spiracle; tail about half as long as body------ zonura
a^2. Gymnura. No dorsal fin.
  c^1. Tail nearly long as body------------------------------------ poecilura
  c^2. Tail half long as body.
    d^1. Chin without 2 denticles.
      e^1. Uniform brown above------------------------------------ japonica
      e^2. Two large white blotches above---------------------- bimaculata
    d^2. Chin with pair of wide-set denticles-------------------------- crooki
  c^3. Tail less than half long as body------------------------------ micrura

Subgenus AETOPLATEA Valenciennes

GYMNURA TENTACULATA (Müller and Henle)

Aetoplatea tentaculata (Valenciennes) Müller and Henle, Syst. Beschr. Plagiostomen, p. 175, 1841 (type locality: Red Sea, Malabar).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 82, 1853 (reference).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 630, 1865 (types).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 411, 1913 (Red Sea, Indian Ocean, Malabar).

Pteroplatea tentaculata Günther, Cat. Fish. Brit. Mus., vol. 8, p. 488, 1870 (copied).—Annandale, Mem. Indian Mus., vol. 2, p. 40, pl. 4, fig. 4, 1909 (off Hughli River mouth, Orissa and Ganjam coasts, in 15–30 fathoms).

Pteroplatea australis Ramsay and Ogilby, Proc. Linn. Soc. New South Wales, vol. 10, p. 575, 1885 (type locality: Cape Hawke, New South Wales).—Ogilby, Proc. Linn. Soc. New South Wales, vol. 10, p. 466, 1885 (no description); Cat. Fishes Australian Mus., pt. 1, p. 22, 1888 (type; Broken Bay); Ann. Queensland Mus., No. 9, p. 5, 1908 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 88, 1916 (Moreton Bay, off Port Curtis and Cape Gloucester, 14–25 fathoms; note).—McCulloch, Australian Zool., vol. 1, pt. 4, p. 89, pl. 1, fig. 3, 1917 (Tuggerah Lakes, New South Wales).—

McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—McCulloch, Fishes New South Wales, ed. 2, p. 13, pl. 3, fig. 40a, 1927.

Pteroplatea natalensis Gilchrist and Thompson, Ann. South African Mus., vol. 11, p. 56, 1911 (type locality: Natal); Ann. Durban Mus., vol. 1, p. 288, 1916 (reference).—Von Bonde and Swart, Fisher. Marine Biol. Surv. South Africa Rep., No. 3, 1922, p. 17, 1924 (reference).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 81, 1925 (Natal).

Head to hind spiracle edge 5¾ in total length. Snout 1⅖ in head as seen above with short point in broad obtuse profile; orbit 4, 2½ in snout, 3½ in interorbital; interorbital 1⅕ in head. Tentacle at hind angle of spiracle variable in length, always slender and pointed.

Tail variable, usually less half as long as disk in adult, sometimes with faint dorsal and anal cutaneous folds; serrated spine minute or absent; dorsal about twice long as high, more than half long as inner ventral edge and its front border nearer base than terminal ends of ventrals; pectorals form disk little less twice as broad as long in adult, more than twice as broad in young, angles somewhat rounded in both.

Young greenish slate above, marked with irregular roundish spots of dark brown and with faint and close reticulation of paler shade of brown. This reticulation separates closely set roundish areas of ground color. With age brown spots enlarge and assume greenish color, finally become dark olive and occupy greater part of surface. Faint reticulation disappears and large spots and blotches of yellowish green develop. Tail faintly barred at all ages. Adult above without minute dark dots and faint markings of tail. Young white below, with age marbled and clouded darker. Reaches disk width of 730 mm. (Annandale.)

Red Sea, South Africa, India, Australia. In depths of 15 to 30 fathoms. I am unable to find satisfactory distinctive characters in the descriptions of the nominal *Pteroplatea australis* Ramsay and Ogilby and *Pteroplatea natalensis* Gilchrist and Thompson, the latter only based on a young male but 280 mm. wide with a nonserrate caudal spine and undeveloped teeth.

U.S.N.M. No. 39978. Cape Hawke. Australian Museum. Length, 440 mm.

GYMNURA ZONURA (Bleeker)

Aetoplatea zonurus Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 79, 1852 (type locality: Batavia, Java).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 631, 1865 (copied).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 411, 1913 (Singapore and Batavia).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference).

Pteroplatea zonura Günther, Cat. Fishes British Mus., vol. 8, p. 488, 1870 (type).—Annandale, Mem. Indian Mus., vol. 2, p. 40, pl. 4, fig. 3, 1909 (Puri, Orissa coast, in 15–20 fathoms).

Head to hind spiracle edge 7 in total length. Snout 1⅓ in head to hind spiracle edge, as seen above with short though distinct point in convex profile; orbit 5, 3 in snout, 4½ in interorbital; nasal flap nearly straight, barely fringed; interorbital nearly equals head to hind spiracle edge.

Tail variable, often more than half as long as disk; serrated spine minute or absent, and low cutaneous fold sometimes present on under surface of tail; dorsal twice long as high, about ⅓ long as free part of pectorals and front border slightly placed before hind border of pectorals.

Olive-green above, minutely and closely speckled with darker dots, boldly marked with large round or irregular spots of greenish yellow and often joined together by irregular lines and blotches of same color, sometimes ocellate. In young dark spots paler and less numerous, while spots less irregular and of brownish color. Ventral surface without pigment. Tail white below with row of large longitudinally oval blackish spots above. Reaches disk width of 850 mm. (Annandale.)

India, Singapore, East Indies.

Subgenus GYMNURA Kuhl

GYMNURA POECILURA (Shaw)

Raja poecilura SHAW, General zoology, vol. 5, p. 291, 1804 [on *Tenkee kunsal* Russell, Fishes of Coromandel, vol. 1, p. 4, pl. 6, 1803 (type locality: Vizagapatam)].

Trygon poecilurus BENNETT, Life of Raffles, p. 694, 1830 (Sumatra).

Pteroplatea poecilura GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 412, 1913 (Red Sea, India, Calcutta, Pinang, Java).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1^e note, p. 6, 1926 (Gulf of Siam).—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference).

Pteroplatea poeciloura FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 102, 1928 (Bombay) (error).

Gymnura poecilura FOWLER, List Fish. Malaya, p. 18, 1938 (reference).

Gymnura micrura (not Schneider) KUHL, Algemein Konst Letterbode, p. 316, 1823 (Java).

Pteroplatea micrura MÜLLER and HENLE, Syst. Beschr. Plagiost., p. 169, 1841 (India).—RICHARDSON, Ichth. China Japan, p. 197, 1846 (China and Java Seas, Indian Ocean, Red Sea).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 409, 1849 (part).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. (65) 76, 1852 (Batavia and Samarang); (Bengal), vol. 25, p. 9 (on *Tenkee kunsal* Russell), p. 24 (on Mc Clelland), p. 25, 1853 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 613, 1865 (Sea of the Indies, mouth of Ganges).—DAY, Fishes of Malabar, p. 278, 1865.—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 487, 1870 (Calcutta, Pinang, Singapore, India).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Bangkok).—DAY, Fishes of India, pt. 4, p. 741, pl. 194, fig. 2, 1878; Fauna British India, Fishes, vol. 1, p. 56, fig. 23, 1889.—VOLZ, Nat. Tijdschr. Nederland Indië, vol. 66, p. 241, 1907 (Sumatra).—ANNANDALE, Mem. Indian Mus., vol. 2,

p. 39, 1909 (Puri).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E43–E45, E49.—PEARSON, Ceylon Administr. Rep., 1915–18, pp. F11–F14.

Pteroplatea micrurus BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Nagasaki, China, East Indies, Malacca, Bengal, Red Sea); Nat. Tijdschr. Nederland. Indië, vol. 21, p. 136, 1860 (Muntok, Banka).

Dasyatis micrura GRAY, List fish British Museum, p. 122, 1851 (Calcutta, India, Singapore).

Dasyatis microura BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 37, 1860 (Calcutta).

Pastinaca kunsal CUVIER, Règne animal, ed. 2, vol. 2, p. 400, 1829 (on *Tenkee kunsal* Russell).

Pteroplatea annulata SWAINSON, Nat. Hist. Animals, vol. 2, p. 319, 1839 (on *Tenkee kunsal* Russell).

Raia pastinaca var. *altavela* (not Linnaeus) LICHTENSTEIN, Descr. Anim. Forster, p. 256, 1844 (Tanna, Society Islands).

Head greatly depressed; snout about 1⅙ in interorbital; eye 5½; mouth width 1⅕; teeth in about 40 rows in each jaw; internasal space 1⅓ in width; interorbital flat, with broad median depression, greater than interspiracle width. Spiracle larger than eye, without tentacle.

Skin smooth.

No dorsal; tail without dorsal folds, without caudal spine; disk length 1$\frac{9}{10}$ in width.

Brown above. Iris gray. Tail whitish, with 9 broad blackish bands much wider than pale interspaces.

Red Sea, India, Ceylon, Pinang, Singapore, East Indies, Siam, China, Japan, Polynesia.

1 example. A.N.S.P. Bombay, India. Dr. F. Hallberg. Disk length, 153 mm., tail, 90 mm., disk width, 285 mm.

GYMNURA JAPONICA (Schlegel)

Pteroplatea japonica SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 309, pl. 141, 1850 (type locality: Nagasaki Bay).—BLEEKER, Act. Soc. Sci. Indo-Néerl. (Japan), vol. 2, p. 45, 1857.—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 614, 1865 (copied).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 662, 1903 (Wakanoura).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Tokyo).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 413, 1913 (Japan).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 187, 1920 (Boshiu).—CHABANAUD, Service Océanogr. Pêches Indochine, 1ᵉ note, p. 6, 1926 (Cambodia).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (Japan.)—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 15, 1931 (Nagasaki).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 274, fig. 26, 1932 (Chefoo).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 170, figs. 14–14a, 1932 (Tsingtao).—WANG, Contrib. Biol. Lab. Sci. Soc. China, vol. 9, No. 3, p. 112, 1933 (Chekiang).—TANAKA, Jap. Fish. Life Colours, No. 34, 1933.

Dasyatis micrura var. *japonicus* GRAY, List fish British Museum, p. 122, 1851 (Japan, China).

Pteroplatea hirundo (not Lowe) ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 60, 1897.—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, pl. 5, fig. 6 (teeth), 1932 (Tsingtao).

Depth 12 to 12¾ to end of tail; head 4 to 4¼, disk length 1⅘ to 1⅞ in width; tail length to base 2⅒ to 2⅘ in disk length. Snout 1⅔ to 1⅘ in head forms very slight angle to obtusely conic front profile of disk; eye 6 to 8 in head, 4 to 5 in snout, 5 to 5⅗ in interorbital; mouth width 1⅘ to 2 in head; teeth in 30 to 40 rows in jaws, each with sharp, triangular denticle; nostril broad, oblique, internarial width 1⅓ to 1⅖ in mouth width; front nasal valve broad, low lobe, hind valve short fold extending half way to internarial; interorbital 1½ to 1⅗ in head, broad, level, with broad median fontanel forming concave depression. Gill openings small, equidistant, last shortest. Spiracles large, broad, transverse; eye 1¼ to 1⅓ in spiracle.

Skin smooth. Small caudal spine long as spiracle, or shorter.

No dorsal or anal; tail slender, conic, tapers to firm, slender point; pectoral wide lobe, front edge little undulate, hind edge little convex, apex obtuse; ventral small, broad, 2⅕ to 2¼ in head; claspers short, depressed, firm points, reach hind ventral edge.

Above uniform umber. Tail whitish, with 6 black blotches above, wider than pale interspaces. Under surface of disk whitish.

China, Japan, Korea.

U.S.N.M. No. 75878. Japan ? P. L. Jouy. Length, 223–260 mm. 2 examples.
U.SN.M. No. 75879. Japan ? P. L. Jouy. Length, 200 mm.
U.S.N.M. No. 71902. Tokyo market. *Albatross* collection 1906. Length, 220 mm.

GYMNURA BIMACULATA (Norman)

Pteroplatea bimaculata NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 16, p. 270, 1925 (type locality: Yenting, Chekiang Province, China).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (copied); Hong Kong Nat. vol. 1, p. 182, 1930 (compiled).

Pteroplatea micrura (not Schneider) RICHARDSON, Ichth. China Japan, p. 197, 1846 (China Seas).

Pteroplatea jordani CHU, China Journ., Shanghai, vol. 12, No. 6, p. 357, pl. 1930 (type locality: Ning-po fish market; East Sea, China).

According to Norman closely related to *Pteroplatea japonica* Schlegel, but with the anterior margins of the disk less undulated and the tail a little shorter; pair of large, ovate, bluish white spots separated by distance equal twice interorbital width, their anterior edges level with the hinder margins of the spiracles. Greatest width, 365 mm., length from snout tip to vent, 170 mm., from vent to tail end, 87 mm.

GYMNURA CROOKI Fowler

FIGURE 12

Gymnura crooki FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 241, fig. 6, 1933 (type locality: Kowloon, China).

Depth 14 to end of tail; head 4½; disk length 1⅘ its width; tail 2 in disk length. Snout 1⅗ in head, forms short blunt end of wide obtuse angle of front profile; eye 9 in head, 6 in snout, 5½ in interorbital; mouth width 2 in head; teeth in 65 rows above, 45 below, each tooth with 1 to 3 slender cusps of which median largest; nostril broad, oblique, internarial 3½ in mouth width, front valve broad lobe, hind valve low short fold extending halfway to internarial; interorbital 1⅗ in head, broad, nearly level except concave depression due to broad fontanel. Gill openings small, last smallest, equidistant. Spiracle large, oblique, deep, twice eye.

Skin smooth. No caudal spine.

No dorsal. Scarcely an anal developed, unless low rudimentary ridge on tail below. Tail rather robust, flexible, tapers to rather strong point. Pectoral wide lobes, front edge little concave and hind edge little convex, apex broadly convex. Ventral small, long, with claspers conic, rather large and along inner edge of ventral long as its outer edge, which 2 in head.

Back uniform dusky brown. Below whitish. Tail light or pale brownish, irregularly blotched or spotted above with dark brown, like back, only about half of blotches crossing over lower surface of tail narrowly and of more pale tint than above.

My specimen differs from Schlegel's plate of *Pteroplatea japonica* in that it not only has no trace of a caudal spine and no trace of any removal of such, could it have been present, but also the coloration of the tail is very different. Schlegel's figure shows the tail as whitish with 5 black, well-contrasted transverse bands, the terminal 3 of which are clearly wider than the pale interspaces. My specimen also shows a hard knoblike denticle on the lower jaw each side of the middle and projecting, each of these knobs about opposite the limit of the internarial space.

GYMNURA MICRURA (Schneider)

Raja micrura SCHNEIDER, Syst. Ichth. Bloch, p. 360, 1801 (type locality: "Surinam" [likely erroneous]).

Trygonobatus micrurus BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 112, 1816 (name only).

Pteroplatea micrura CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1409, 1849 (Pinang, Malay Peninsula, Singapore).—DAY, Fishes of Malabar, p. 278, 1865.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Buntal and Moratabas).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 194, 1904 (locality?).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 461

(Baram, North Borneo).—Volz, Nat. Tijdschr. Nederl. Indië, vol. 66, p. 241, 1907 (Sumatra).—Lloyd, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—Pellegrin, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 5, 1912 (Singapore).—Pearson, Ceylon Administr. Rep., 1912–13, p. E11.—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran).—Pearson, Ceylon Administr. Rep., 1914, p. E5.—Jordan and Starks, Ann. Carnegie Mus., vol. 2, p. 430, 1917 (Ceylon).—Vinciguerra,

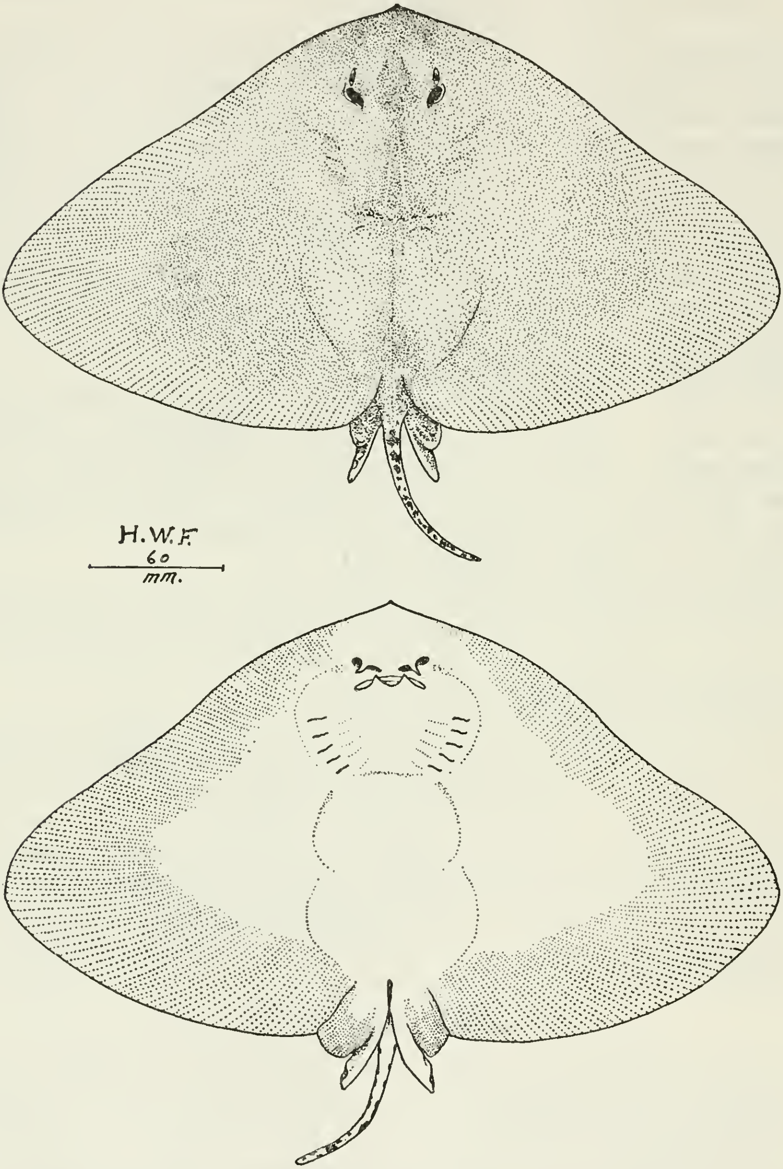

Figure 12.—*Gymnura crooki* Fowler: Type (U.S.N.M. No. 6830).

Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 625, 1926 (Sarawak).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).—Tirant, Service Océanogr., Pêches Indo-Chine, 6ᵉ note, p. 78, 1929 (Phuroc hai).—Borodin, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (no locality).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (East Indies).—Chevey, Inst. Océanogr. Indochine, 19ᵉ note, p. 7, 1932 (Cochinchina).—Suvatti, Index Fish. Siam, p. 5, 1937 (Laem Sing; Sriracha; Maenam Cau Phaya).

Gymnura micrura Fowler, List Fish. Malaya, p. 17, 1938 (reference).

Ceratoptera ehrenbergii (not Müller and Henle) Day, Fishes of India, pt. 4, p. 745, fig. 1878 (type locality: Madras). (Monstrosity.)

Astrape dipterygia (not Schneider) Day, Fishes of India, Suppl., p. 812, 1888 (same example).

Pteroplatea hirundo (not Lowe) Elera, Cat. Fauna Filip., vol. 1, p. 621, 1895 (Manila, Luzon).

? *Planerocephalus ellioti* Gratzianow, Zool. Anz., 1906, pp. 403, 404. [Madras, Indian Ocean (on Day; monstrosity).]

Depth 15⅕ to end of tail; head 4⅓, disk length 1⅞ in its width; tail length to base 3 in disk length. Snout 1⅗ in head, forms blunt end of wide, obtuse angle of front profile; eye 7⅕ in head, 5 in snout, 5 in interorbital; mouth width 1¾ in head; teeth 60 to 65 rows, each with short pointed cusp; nostril broad, oblique, internarial 1⅖ in mouth width, front valve broad low lobe, hind valve short, fold extending halfway to internarial; interorbital 1½ in head, broad, level, with board median fontanel forming concave depression. Gill openings small, equidistant, last shortest. Spiracles large, broad; eye 1¾ in spiracle.

Skin smooth. No caudal spine.

A small rudimentary dorsal long as eye. No anal. Tail slenderly conic, tapers to rather firm point. Pectoral wide lobe, front edge slightly undulate, hind edge little convex, apex obtuse. Ventral small, broad, 2 in head.

Back nearly uniform blackish brown. Tail with end broadly blackish and two blackish saddles above, below whitish. Under surface uniformly whitish, slightly brownish or soiled on pectorals apically.

Arabian Sea, India, Ceylon, Malay Peninsula, Pinang, Singapore, East Indies, Indo China, Philippines.

U.S.N.M. No. 39978. Cape Hawke. Australian Museum. Length, 440 mm.

Family MYLIOBATIDAE

Body, head, and pectorals form lozenge-shaped disk. Tail long, slender, whiplike and usually with basal serrated spine. Eyes prominent, lateral. Teeth angular, broad, flat, tessellated, median series commonly wider than laterals, if any. Spiracles large, behind eyes, opening laterally. Cranium prominent. Tail often with small dorsal on basal portion. Pair of rostral fins, joined in front of snout, either separated from pectorals or connected with them at side of head.

Large sting rays of tropical or subtropical seas, feeding chiefly on mollusks, which they crush with their large grinding teeth, though usually less of bottom dwellers than the true rays. In moving through the water they seem to appear as if flying or soaring. Aquarium specimens have been known to utter a rather loud bellowing noise when taken from the water. Like the sting rays, these creatures are also dreaded for their murderous spines on the tail, so they are usually removed by the fishermen. All the known genera represented by fossils.

ANALYSIS OF GENERA

- a^1. Myliobatinae. Snout in single lobe; pelvis arched.
  - b^1. Teeth in more than 3 rows in each jaw.
    - c^1. Side of head not free from pectorals............ **Holorhinus**
    - c^2. Side of head free from pectorals.
      - d^1. No caudal spine............ **Aetomylus**
      - d^2. Caudal spine present............ **Myliobatis**
  - b^2. Teeth in 1 row in each jaw............ **Aetobatus**
- a^2. Rhinopterinae. Snout in 2 separate lobes; pelvis greatly arched. **Rhinoptera**

Genus HOLORHINUS Gill

Holorhinus Gill, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 331. (Type *Rhinoptera vespertilio* Girard, monotypic.)

Myliobatis (not Geoffroy Saint-Hilaire) (Duméril) Cuvier, Règne animal, vol. 2, p. 13, 1817. (Type, *Raja aquila* Linnaeus, designated by Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 50, 1883.)

Myliobates Schinz, Thierreich Cuvier, vol. 2, pt. 19, pp. 234, 832, 1822.—(Berthold) Latreille, Nat. Fam. Tierr., p. 108, 1827. (Type, *Raja aquila* Linnaeus.)

? *Ictaetus* Rafinesque, Analyse de la nature, p. 93, 1815. (Atypic, nomen nudum.)

? *Ptychopleurus* Agassiz, Rech. Poiss. Fossiles, vol. 3, p. 67, 1837; Poissons fossiles, vol. 3, pl. 45, figs. 1–3, 1838. (Type, *Ptychacanthus* (*Ptychopleurus*) *faujasii* Agassiz, monotypic, fossil.)

Bates Probst, Würtembergs Jahresb., vol. 33, p. 88, 1877. (Type, *Bates spectabilis* Probst, monotypic, fossil.)

Disk wide. Tail long, slender, whiplike, strong retrorsely serrated spine above base and behind dorsal. Head moderately prominent. Eyes lateral. Teeth hexangular, flat, tessellated, in 7 rows, median wider, laterals narrow. Front nasal valves confluent in broad flap with free edge before mouth and joined by frenum to upper jaw. Spiracles lateral. Skin smooth. Dorsals small, between ventrals. Pectorals slender, falciform, continue along side of head to snout end where joined to form simple lobe. Ventrals short, wide, not emarginate.

All warm seas. Numerous fossils, mostly flat dental plates, known from the Cretaceous and Tertiary. Ovoviparous. The following imperfectly described nominal species not seen since originally described:

HOLORHINUS RHOMBUS (Basilewsky)

Myliobatis rhombus Basilewsky, Nouv. Mém. Soc. Nat. Moscou, vol. 10, p. 250, 1855 (type locality: Pekin).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 434, 1913 (copied).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference); Hong Kong Nat., vol. 1, p. 185, 1930 (compiled).

Head truncate; mouth transverse; teeth tetragonal, smooth, broad, in pavement. No dorsal; tail long, filiform, rough with sharp tubercles; pectorals fleshy, acutely and prominently pointed, form rhomboidal disk; ventrals 2, fleshy, broad, end behind disk. Above brown, white below. Disk width, 535 mm., length, 508 mm., tail, 458 mm. (Basilewsky.)

ANALYSIS OF SPECIES

a^1. Snout short, broad, rounded.
  b^1. Dorsal origin more than 2 lengths of base behind ventral bases.
    c^1. Median upper teeth 4 to 6 times broad as long above; brown.
      d^1. Orbital horn longer; snout little pointed .... **aquila**
      d^2. Orbital horn shorter; snout more pointed .... **cervus**
    c^2. Median upper teeth 1⅕ to 2⅘ times broad as long.
      e^1. Purple above .... **hamlyni**
      c^2. Yellowish olive-brown above, with 26 to 28 large irregular light-blue spots .... **australis**
  b^2. Dorsal origin 1 base length behind ventral bases; yellowish olive above, with blue transverse bars on head and across disk .... **tenuicaudatus**
a^2. Snout elongate, pointed; dorsal origin 1½ lengths of base behind ventral bases; light brown, young with many lighter or reddish spots, most distinct posteriorly .... **tobijei**

HOLORHINUS AQUILA (Linnaeus)

Raja aquila Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 232, 1758 (type locality: Mediterranean Sea); ed. 12, vol. 1, p. 396, 1766.

Myliobatis aquila Gray, List fish British Museum, p. 128, 1851 (reference).—Guichenot, Notes ile Réunion, vol. 2, p. 32, 1863.—Regan, Ann. Natal Gov. Mus., vol. 1, pt. 3, p. 242, 1908 (Bird Island, Natal).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 475 (Bonaparte material).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, pt. 3, p. 288, 1916 (reference).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 82, pl. 4, fig. 7, 1925 (Walfish and Table Bays, Indian Ocean).

Myliobates aquila Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).

Myliobatis noctula Bonaparte, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 2, descr., pl., fig., 1833 (type locality: Italy).

Snout $1\frac{5}{7}$ to 2 in head; mouth width 2⅛ to 2¾; internarial 2⅞ to 3⅓; preoral length 1⅔ to 2; front ventral edge 1 to 1½; dorsal length 3 to 4¼; ventral width $1\frac{1}{10}$ to 1⅗. Disk length, 125 to 225 mm., width, 219–347 mm., tail, 292–408 mm.

A.N.S.P. Nos. 410–413. Italy. C. L. Bonaparte (No. 217). All females. Cotypes of *Myliobatis noctula*.

HOLORHINUS CERVUS (J. L. B. Smith)

Myliobatis cervus J. L. B. SMITH, Rec. Albany Mus., vol. 4, p. 169, fig. 1, 1935 (type locality: Knysna; Cape Agulhas; Bushman River; Port Alfred; Great Fish Point).

Disk 1¾ times wide as long. Pectoral tips moderately pointed, subfalcate. Snout not very blunt, rounded, with apical point. Flanges on side of head, connecting rostrals with pectorals, very narrow. Circular flap of iris projecting over most of pupil from above. Males with small conical horn above orbit. Central series of teeth 4 to 5 times wide as long.

Skin smooth, no tubercles.

Dorsal small, projects beyond hind edge of base, originates 3 to 3½ lengths of base behind posterior part to margin of ventral base, 1 to 1½ lengths of base behind end of ventral. Males with 2 serrated caudal spines, posterior longer, females with 1 or 2 spines. Caudal 1½ to 2 times long as disk.

Color uniform brown.

Length of female up to 4 feet (1,220 mm.) across disk, male usually much smaller. (J. L. B. Smith.)

South Africa. Females differ from *Holorhinus aquila* in the shape of the snout, somewhat more pointed in *H. cervus*, and this the only apparent difference in the female. Orbital horn of *H. cervus* very slight. "Full specific distinction of *cervus* from *aquila* is perhaps of doubtful validity, since the females of these species cannot easily be distinguished one from another."

Holorhinus cervus differs from the related *H. tobijei* in the wider disk and in the more posterior insertion of the dorsal.

HOLORHINUS HAMLYNI (Ogilby)

Myliobatis hamlyni OGILBY, Ann. Queensland Mus., No. 10, p. 40, 1911 (type locality: Moreton Bay, Queensland); Mem. Queensland Mus., vol. 5, p. 89, 1916 (Moreton Bay; note).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (compiled).

Head length 2¾ in disk length from snout tip to hind angle of vent. Snout 4¾ in disk length, tip broadly rounded; eye 2⅔ in snout length, 2⅖ in firm interorbital, 4$\frac{1}{10}$ in interocular; mouth width 1½ in snout length, upper jaw with 6 and lower 9 series of dental plates, each of 7 teeth, as wide transverse median which gradually increases in width from front and 3 small laterals directed outward and backward and of equal size throughout; in upper jaw with first median wide as and last 2⅕ times 3 lateral teeth; in lower jaw first half wide as, third wide as, and last twice wide as lateral 3, fifth median lower tooth 2⅗ times wide as long; internarial frenum smooth, hind edge of flap truncate and coarsely fringed, tips of fringes lobate and front nasal angle nearer middle of flap than snout tip; interorbital fontanel deepest and widest anteriorly, greatest width 2⅓ its length; interocular 3 in disk length. Spiracle wide, slightly oblique, extends outward forward to hind lower angle of orbit, inner opening wider than eye diameter. Gill openings narrow, subequal.

Body smooth.

Dorsal fin begins behind ventral tips, its vertical height 1⅓ its length which equals eye; tail long (broken), slender, without folds, spine well developed; pectorals form disk length 1⅘ its width, which slightly behind front edge of abdominal region, front and hind borders gently undulous, outer angle obtusely pointed and bent conspicuously backward; outer ventral border feebly rounded, base 1⁷⁄₁₀ its length.

Upper surface and tail behind spine purple, pectoral fins shading outwards to olive brown. Lower surfaces cream color. Disk length, 152 mm., width, 280 mm. (Ogilby.)

Queensland.

HOLORHINUS AUSTRALIS (Macleay)

Myliobatis australis Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 380, 1881 (type locality: Port Jackson).—McCoy, Prodromus Zool. Victoria, pl. 63, 1882.—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 22, 1888 (Port Jackson and Parramatta River).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 46, 1890 (reference).—Waite, Mem. Australian Mus., vol. 4, p. 47, 1899 (New South Wales); Mem. New South Wales Nat. Club, No. 2, p. 1, 1904.—Stead, Fishes of Australia, p. 233, 1908.—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—McCulloch, Fishes of New South Wales, ed. 2, p. 13, pl. 3, fig. 41a, 1927.

Aetobatus australis McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 15, 1911 (Shoalhaven Bight, New South Wales, in 15–45 fathoms); Biol. Res. *Endeavour*, vol. 2, pt. 3, p. 86, fig. 3, 1914 (dentition) (New South Wales).

Myliobatus aquila (not Linnaeus) Günther, Cat. Fishes British Mus., vol. 8, p. 489, 1870 (Sydney).—Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 225, 1872 (Hobson's Bay).—Hector, Colonial Mus. Governm. Surv. Dept. (Fishes of New Zealand), p. 86, 1872 (on Banks).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 380, 1881 (Port Jackson; on Günther).

Myliobatis nieuhofii (not Schneider) Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 226, 1872 (Melbourne market).

Myliobatis nienhofii Macleay, Proc. Linn. Soc. New South Wales, vol. 5, p. 316, 1880 (Port Phillip, on Castelnau); vol. 6, p. 380, 1881 (error).

Myliobatis tenuicaudatus (not Hector) Garman, Mem. Mus. Comp. Zool., vol. 36, p. 433, 1913 (Australia; not New Zealand).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference; part).

Depth 5 to 5⅓ in disk length measured to hind pectoral edge; head 3⅖ to 3⅗; disk length 1⅗ to 1¾ in its width, disk length

1⅕ to 1¼ in tail. Snout 1⅔ to 1⅘ in head; rostral fins forming broadly convex lobe in front; eye 3⅞ to 5, 2¾ to 2⅞ in snout, 3¾ to 4 in interorbital; dentary width 2¼ to 2½ in head; teeth with broad median row 2 to 6 times wide as long, with 2 lateral rows each side; upper lip with narrowly fringed edge, lower pleated; nostrils simple, deep pits, internarial width 1⅕ in dentary width; interorbital 1 to 1⅖ in head, level, with wide median depression due to broad fontanel. Gill openings equidistant, last shortest. Spiracle deep lateral slit, twice eye, opens laterally.

Skin smooth. Caudal spine 1½ in interorbital.

Dorsal length 3½ in head; no anal; tail long, slender, whiplike; pectorals wide, triangular, front edge nearly straight, hind edge slightly concave, ends in rather obtuse front point and acute hind point; ventrals short, broad, hind edge broadly convex; claspers short, flat, somewhat pointed.

Rather dark brown above. Under surface whitish. Tail and dorsal all dusky, at least terminally.

Queensland, New South Wales, Victoria. According to McCulloch attains a width of 1,220 mm.

U.S.N.M. No. 59887. Port Jackson. D. G. Stead. Length, 445 mm.

U.S.N.M. No. 59888. Wouboyn? River, New South Wales. D. G. Stead. Length, 498 mm.

HOLORHINUS TENUICAUDATUS (Hector)

Myliobatis tenuicaudatus Hector, Trans. New Zealand Inst., vol. 9, p. 468, pl. 10, 1877 (type locality: Wellington Harbor, New Zealand).—Waite, Rec. Canterbury Mus., vol. 1, No. 1, p. 9, 1907 (reference); vol. 1, No. 2, p. 152, 1909 (off Poverty Bay and Bay of Plenty, in 16 to 57 fathoms).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 433, 1913 (New Zealand; not Australia).—Waite, Rec. South Australian Mus., vol. 2, p. 34, fig. 48, 1921.—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference; part).

Myliobatis aquila (not Linnaeus) Günther, Cat. Fishes British Mus., vol. 8, p. 489, 1870 (part).

Head to hind spiracle edge 6 in total length. Snout 1⅘ in head to hind spiracle edge, as seen from above front profile broadly convex; eye 5, 3 in snout, 3½ in interorbital; teeth in pavementlike plates, upper flat, lower curved, all yellow; both plates in 2 series, median broad row and 2 laterals, latter of rows of subcircular plates, 3 in width and together about half width of median series, not extending to front of mouth; upper median plates 11, lower 7; nostrils close together, separated by thick columnar frenum; nasal fold long and rectangular, hinder border concave and papillose, widest at free edge where twice its length; interorbital 1⅖ in head. Spiracle twice eye diameter.

Body smooth.

Dorsal small, base ⅙ less than spiracle, on tail with middle over hinder ventral edge; 2 serrated spines on tail behind fin; tail little shorter than disk; pectorals form broad disk, length 1⅗ its width, front edges little undulate, hind edges concave, outer angles triangular.

Yellowish olive above, with blue transverse bars on head and across disk. Tail black. Lower surfaces white. Total length, 775 mm. (Waite.)

New Zealand.

HOLORHINUS TOBIJEI (Bleeker)

Myliobatis tobijei Bleeker, Verh. Batav. Genootsch. (Japan), vol. 26, p. 130, 1857 (type locality: Nagasaki); Nederland. Tijdschr. Dierk., vol. 4, p. 115, 1874 (Chinese drawing).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Yokohama).—Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 43, 1901 (Nagasaki; Yokohama).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 663, 1903 (Tokyo, Hakodate, Onomichi, Hiroshima, Hakata, Nagasaki).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 433, 1913 (Japan).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, No. 3, p. 3, 1928 (Fusan and Mokpo, Korea).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (Japan).—Schmidt, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 15, 1931 (Nagasaki).—Lin, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 172, pl. 3, fig. 10 (teeth), 1932 (Tsingtao).—Fang and Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 277, fig. 27, 1932 (Chefoo).—Tanaka, Jap. Fish. Life Colours, No. 35, 1933.—Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 113, 1933 (Ningpo).

Aetobatis tobijei Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 489, 1912 (Naha, Okinawa).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Rikuzen).—Taranetz, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 52, 1937.

Myliobates aquila (not Linnaeus) Schlegel, *in* Siebold's Fauna Japonica, Poiss., pt. 310, pl. 142, 1850 (Japan).

Myliobatis aquila Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Japan).—Günther, Rep. Voy. *Challenger*, vol. 1, pt. 4, p. 63, 1880 (Yokohama).—Pietschmann, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 638, 1908 (Japan).

Myliobatis cornuta Günther, Cat. Fishes British Mus., vol. 8, p. 490, 1870 (type locality: Japan).—Ishikawa and Matsuura, Prelim. Cat. Fish. Mus. Tokyo, p. 60, 1897.

Myliobatis cornutus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 43, 1901 ("Japan").

Depth 5½ to 5¾ in disk length as measured to hind pectoral edge; head 3 to 3⅕; disk length 1⅘ to 2 in its width, 2 in tail. Snout 1¾ to 1⅘ in head; eye 6 to 7½, 3¼ to 4¾ in snout, 5¼ to 5½ in interorbital; dentary width 2⅓ to 2⅗ in head; teeth with broad median row 4 to 6 times wide as deep and 3 rows of small teeth each side; upper lip with fringed edge, lower with pleats; nostrils each simple deep pit, internarial width 1⅓ in dentary width; interorbital 1⅕ to 1¼ in head, level, with wide median depression due to broad fontanel. Gill openings equidistant, last shortest. Spiracle twice eye, large, deep, open laterally.

Skin smooth. Caudal spine long as head.

Dorsal length 3 in head; no anal; tail long, slender, whiplike; pectorals broad, front edge entire, hind edge little concave, angles rather obtuse; ventrals broad, obtuse, rather short; claspers flattened, conic, ends blunt, each with 2 deep lateral grooves, length 1½ in head.

Back uniform brown, little paler about edges of disk. Tail dusky. Under surface of body whitish.

China, Japan, Korea. None of my specimens show any lighter or paler spots.

U.S.N.M. No. 8067. Nippon. William Stimpson. Length, 575 mm.

U.S.N.M. No. 22611. Miuramisaki, Japan. Imperial Government of Japan. Length, 565 mm.

U.S.N.M. No. 49409. Yokohama, Japan. *Albatross* collection. Length, 565 mm.

U.S.N.M. No. 51297. Nagasaki, Japan. *Albatross* collection. Length, 260 mm. to end of cut off tail.

U.S.N.M. No. 75866. Japan ? P. L. Jouy. Length, 585 mm.

U.S.N.M. No. 75867. Japan ? P. L. Jouy. Length, 550 mm.

U.S.N.M. No. 75868. Japan ? P. L. Jouy Length, 485 mm.

Genus AETOMYLUS Garman

Aetomylus GARMAN, Bull. Mus. Comp. Zool., vol. 51, p. 252, 1908. (Type, *Myliobatis maculatus* Gray, orthotypic.)

Aetomyleus SHARP, Zool. Record, No. 44, 1908, index, p. 1, 1910. (Type, *Myliobatis maculatus* Gray.)

Aetomylæus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 434, 1913. (Type, *Myliobatis maculatus* Gray.)

Disk broad. Tail without caudal spine. Head moderately conspicuous. Teeth with 3 narrow lateral rows each side of wide median row. Rostral fins not continuous with pectorals at side of head, placed on lower level and united in one lobe.

ANALYSIS OF SPECIES

- a^1. Dorsal origin behind ends of ventral bases.
  - b^1. Back with median small spines and tubercles; brown-edged ocelli on hind part of disk ---------- maculatus
  - b^2. Back smooth; brownish with network of black, anteriorly in bands. vespertilio
- a^2. Dorsal origin opposite ends of ventral bases.
  - c^1. Disk less twice wide as long; green brown-edged ocelli on hind part of disk ---------- milvus
  - c^2. Disk twice wide as long; about 5 blue cross bands, disappearing with age. nichofii

AETOMYLUS MACULATUS (Gray)

Myliobatis maculatus GRAY, Illustr. Indian Zool., Hardwicke, vol. 2, pl. 101, 1832–34 (type locality: Pinang).—MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 178, 1841 (India).—GRAY, List fish British Museum, p. 129, 1851 (no locality).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 84, 1852 (Batavia, Samarang, Pasuruan); (Bengal), vol. 25, p. 82, 1853 (reference); Act. Soc. Sci. Indo-Néerl., vol. 5, no. 7, p. 2, 1859 (Sinkawang, Borneo); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 639, 1865 (copied).—BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 490, 1870 (India).—DAY, Fishes of India, pt. 4, p. 742, 1878; Fauna British India, Fishes, vol. 1, p. 59, 1889.—FOWLER, List Fish. Malaya, p. 19, 1938 (reference).

Myliobates maculatus RICHARDSON, Ichth. China Japan, p. 198, 1846 (China Sea).

Myliobatis maculata ANNANDALE, Mem. Indian Mus., vol. 2, p. 53, 1909 (off Orissa).

Myliobalis maculata MALPAS, Ceylon Administr. Rep., 1921, p. E8 (error).

Aetomylaeus maculatus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 435, 1913 (Indian Seas, East Indies, Pinang).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 90, fig. 7, 1935 (Bangkok).—SUVATTI, Index Fish. Siam, p. 7, 1937 (Maenam Thai-cin; Sriracha).

Aetomylus maculatus FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference); Hong Kong Nat., vol. 1, p. 183, fig. 22, 1930 (compiled).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 113, fig. 11, 1933 (Yenting).

Myliobatis cyclurus VAN HASSELT, Algemein Konst. Letterbode, p. —, 1823 (type locality: Java); Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824 (Java).

Head to first gill opening 3 in disk length, 13 in tail. Snout 2 in head to first gill opening; eye 6¼, 3 in snout, 4 in interorbital, pupil erect; mouth width 2¾ in head to first gill opening; teeth in median row 5 to 6 times wide as long; internarial 3⅓ in head to first gill opening; interorbital 1½, concave in front of fontanel. Spiracles large, hardly visible from above, 2¼ times long as eye.

Skin rough with small tubercles or spines in dorsal area on young.

Dorsal length about half interorbital, rounded above, hind edge nearly vertical, short free edge behind base ends in right angle, inserted little behind ends of ventral bases; tail over 4 times disk length, without spine; pectorals form broad disk with length 1⅔ its width, outer ends curved, acute, front edge convex, hind edge concave; ventrals longer than broad, inner edge short, hind edge oblique, angles rounded.

Back brown with dark edged rounded spots of whitish posteriorly. Tail indistinctly banded brown and darker. White below. Length, 724 mm. (Garman.)

India, Pinang, Singapore, East Indies, China Sea.

AETOMYLUS VESPERTILIO (Bleeker)

Myliobatis vespertilio BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 85, 1852 (type locality: Batavia).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 636, 1865 (copied).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 490, 1870 (copied).—FOWLER, List Fish. Malaya, p. 20, 1938 (reference).

Aetomylaeus vespertilio GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 437, 1913 (Batavia and Pinang).—SUVATTI, Index Fish. Siam, p. 7, 1937 (Siam).

Aetomylus vespertilio FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference).

Myliobatis milvus (not Müller and Henle) CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1415, 1849 (part; not synonymy).

Head truncate; snout 6 in greatest disk width; eye 3½ in interorbital, pupil cordiform; median row of teeth 6 times broad as long, lower longer than wide; nasal valves confluent, flap with rounded angles, little notched in middle; oral papillae 6.

Skin smooth. No horn on orbit.

Tail long, without spine; dorsal origin behind ends of ventral bases, fin not extending to ends of ventrals; pectorals form disk nearly twice broad as long, disk length 5⅘ in tail, acute, front edges convex, hind edges concave; hind pectoral angles above ventrals.

Fawn color, with anastomosing black lines arranged transversely on front half of disk so interspaces resemble broad transverse bands; elsewhere lines form open network; front pectoral and dorsal edges without black meshes. Tail brownish near base, with faint blackish rings, otherwise black. Ventral surfaces white. Disk to vent 193 mm., tail, 1,165 mm. (Bleeker; Garman.)

Pinang, Java. Bleeker had a single female 560 mm.

AETOMYLUS MILVUS (Müller and Henle)

Myliobatis milvus (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 178, 1841 (type locality: Red Sea).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1415, 1849 (Pinang).—GRAY, List fish Brit. Mus., p. 129, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 87, 1852 (Batavia and Samarang).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 638, 1865 (Sea of the Indies).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 491, 1870 (China, East Indies).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 686, 1871 (Red Sea).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Batjan).—ELERA, Cat. Fauna Filip., vol. 1, p. 621, 1895 (Manila).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 589, 1912 (Batavia).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 624, 1926 (Sarawak).

Aetomyleus milvus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 435, 1913 (Red Sea, China, East Indies).—FOWLER, Journ. Bombay Nat. Hist. Soc. vol. 33, No. 1, p. 103, 1928 (Bombay).

Aetomylus milvus FOWLER, 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (Indian Ocean); Hong Kong Nat., vol. 1, No. 4, p. 184, 1930 (Indian Ocean).

Aetomylaeus milvus SUVATTI, Index Fish. Siam, p. 7, 1937 (Menam?).

Myliobatis vultur MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 179, 1841 (type locality: China).—GRAY, List fish British Museum, p. 129, 1851 (China).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 640, 1865 (compiled).

Myliobates vultur RICHARDSON, Ichth. China Japan, p. 198, 1846 (Chinese Seas).

Myliobates oculeus RICHARDSON, Ichth. China Japan, p. 198, 1846 (type locality: Sea of China, Canton).

Myliobatis oculeus GRAY, List fish British Museum, p. 129, 1851 (reference).

Skull wide, broadly convex in front; snout about twice long as nasal valves, rounded anteriorly; eye rather small, 5½ in interorbital; mouth width 2½ in interorbital; median teeth 7 or 8 times wide as long and 3 series of small laterals each side; internarial $1\frac{7}{8}$ in preoral length, nasal valves form broad free flap, leaving wide space before teeth, hind edge shortly fringed and with slightly median notch; interorbital level, fontanel moderate. Spiracle little larger than eye.

Body entirely smooth.

Dorsal origin above ends of ventral bases, hind margin not free from tail, edge $1\frac{3}{5}$ in interorbital; tail without spine; disk length $1\frac{2}{5}$ in its width, convex along front edges, hind edges concave and outer angles rather narrow; ventrals little more than interorbital, width little less half length; claspers extend but little beyond ventrals.

Back dark uniform brown, without traces of spots. Below whitish, with disk marginally more or less soiled with dirty brown. Iris dark gray. Tail brown, paler below anteriorly.

Red Sea, India, Pinang, East Indies, Philippines, China.

1 example. A.N.S.P. Bombay, India. Prof. F. Hallberg. Disk length to clasper ends, 280 mm., tail, 328 mm., disk width, 438 mm.

AETOMYLUS NICHOFII (Schneider)

Raja nichofii Schneider, Syst. Ichth. Bloch, p. 364, 1801 (on *Zee-vleermuis* Nieuhof, Gedenk. Reiz., vol. 1, p. 278, fig., 1682, type locality: East Indies).

Aetobatus nichofii Blainville, Bull. Soc. Philom. Paris, vol. 8, p. 112, 1816 (name only).

Myliobatis nieuhowii Cuvier, Règne animal, vol. 1, p. 138, 1817 (on Willoughby).

Myliobatis nieuhofii Müller and Henle, Syst. Beschr. Plagiostomen, p. 177, 1841 (India, New Holland, Mediterranean, Malabar, Pondicherry).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1414, 1849 (Pinang).—Gray, List Fish British Museum, p. 1929, 1851 (reference).—Jerdon, Madras Journ. Lit. Sci., vol. 17, p. 149, 1851.—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 85, 1852 (Batavia); (Bengal), vol. 25, p. 9, 1853 (on *Mookarah tenkee* Russell, Fishes of Coromandel, vol. 1, p. 4, pl. 7, Vizagapatam), p. 82 (reference), 1803; Nat. Tijdschr. Nederland. Indië, vol. 10, p. 348, 1856 (Rio, Bintang); vol. 16, p. 196, 1858 (Sinkawang, Borneo); Act. Soc. Sci. Indo-Néerl., vol. 5, No. 7, p. 2, 1859 (Sinkawang).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 638, 1865 (Pondicherry).—Kner, Reise *Novara*, Fische, p. 421, 1865 (Java).—Bleeker, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).—Günther, Cat. Fishes British Mus., vol. 8, p. 491, 1870 (Pinang, Moluccas, Japan).—Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 227, 1872 (Melbourne materials; Singapore; Malacca); vol. 2, p. 58, 1873 (Melbourne sea).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Singapore).—Day, Fishes of India, pt. 4, p. 742, 1878 (Madras).—Károli, Termesz. Füzetek, Budapest, vol. 5, p. 148, 1881 (Yokohama).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 46, 1890 (passim).—Elera, Cat. Fauna Filip., vol. 1, p. 621, 1895 (Cavite, Luzon).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 604, 1903 (on Günther's Japanese record).—Volz, Nat. Tijds. Nederland. Indië, vol. 66, p. 241, 1907 (Padang).—Annandale, Mem. Indian Mus., vol. 2, p. 51, 1909 (off Orissa, Chittagong, Burma, Ganges mouth).—Bean and Weed, Proc. U. S. Nat.

Mus., vol. 42, p. 588, 1912 (Batavia).—PEARSON, Ceylon Administr. Rep., 1915–18, pp. F10–F14.—MALPAS, Ceylon Administr. Rep., 1921, p. E8.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e note, p. 79, 1929 (Cochin China).

Myliobates nieuhofii RICHARDSON, Ichth. China Japan, p. 198, 1846 (Chinese and Australian Seas).

Myliobatis nieuhofi BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 43, 1901 (Japan).

Myliobatis nieuhofii SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E42, E49, E50.—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).

Myliobatis nichofii FOWLER, List Fish. Malaya, p. 19, 1938 (reference).

Aetomylaeus nichofii GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 436, 1913 (India, East Indies, Japan).

Aetomylus nichofii FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference); Hong Kong Nat., vol. 1, p. 184, 1930 (compiled).

Aetomyleus nichofii CHEVEY, Inst. Océanogr. Indochine, 19^e note, p. 7, 1932 (Indo-China).

Raja fasciata SHAW, General zoology, vol. 2, p. 286, pl. 143, 1804 (on Willoughby; on *Mookarah tenkee* Russell).

Raia macrocephala (Parkinson) RICHARDSON, Ichth. China Japan, p. 198, 1846 (name in synonymy).

Depth 5½ in disk length as measured to hind pectoral edge; head 3⅛ to 3½; disk length 1⅔ to 1⅘ in its width, 2½ to 4⅓ in tail. Snout 1¾ to 2 in head, forms pointed lobe at low level in front; eye 7 to 7⅓, 3⅕ to 4 in snout, 4⅓ to 7 in interorbital; dentary width 2¾ to 3 in head; teeth with broad median row and 3 narrow lateral rows each side; upper lip very finely and inconspicuously fringed, lower entire; nostril each simple deep pit, rather larger internarial little less than mouth width; interorbital 1⅖ to 1½ in head, broad, nearly level with slight depression at fontanel. Gill openings small, subequal, last smallest. Spiracles large, deep, twice eye, shielded above to open laterally.

Skin smooth in young, very finely though imperfectly asperous over much of disk above with age. No caudal spine.

Dorsal triangular, front edge 2⅓ to 3½ in head; no anal; tail long, slender, whiplike; pectoral little broader than long, its front edge nearly straight, hind edge slightly concave, outer and hind angle both narrowly pointed; ventrals long, rather slender, ends convex; claspers ⅘ front ventral edge, conic, extend well beyond fin.

Back dark brown anteriorly with 3 to 5 transverse or horizontal gray bands, posteriorly large, rather close set, variable, rounded grayish blotches. Tail of young rather irregularly blotched dusky or dark brown on whitish ground color. Under surface of body whitish, with age hind margins of pectorals rather narrowly dusky.

India, Ceylon, Burma, Pinang, Singapore, East Indies, Philippines, Cochin China, China, Japan, Australia, Victoria. Of the three specimens reported from Java by Bean and Weed I have examined the two listed below. I do not find that their *Myliobatis milvus*, identified as the larger specimen, is different. The smaller, though with more or less apparent uniform disk, shows traces of a few of the gray horizontal lines anteriorly as well as the posterior spots.

U.S.N.M. No. 72483. Batavia, Java. Bryant and Palmer. Length, 840 mm.
U.S.N.M. No. 72484. Batavia, Java. Bryant and Palmer. Length, 1,540 mm.

Genus MYLIOBATIS Geoffroy Saint-Hilaire

Myliobatis Geoffroy Saint-Hilaire, Descript. Egypte, Poiss., vol. 1, pl. 26, 1809. (Type, *Myliobatis bovina* Geoffroy Saint-Hilaire, designated by Fowler, Geol. Surv. New Jersey Bull. 4, p. 84, 1911.)

Pteromylaeus Garman, Mem. Mus. Comp. Zool., vol. 36, p. 437, 1913. (Type, *Myliobatis asperrimus* Jordan and Evermann.)

Head rather long. Tail long, slender, with serrated spine behind dorsal. Snout somewhat narrowed forward. Teeth tessellate, in 7 rows as very wide median row and each side with 3 very narrow rows. Spiracles open upward. Pectorals falciform, not continuous with rostral fins at each side of head. Ventrals elongate, narrow.

Panama, Eastern Atlantic, Mediterranean, South Africa, Admiralty Islands.

ANALYSIS OF SPECIES

a^1. Dorsal origin above ends of ventral bases; uniform brown, young with 7 or 8 pale transverse streaks ---------- **bovina**

a^2. Dorsal origin near ends of pectoral bases; greenish gray with irregular whitish spots ---------- **punctatus**

MYLIOBATIS BOVINA Geoffroy Saint-Hilaire

Myliobatis bovina Geoffroy Saint-Hilaire, Descr. Egypte, Poiss., vol. 1, pl. 26, fig. 1, 1809; p. 323, 1827 (type locality: Egypt).—Günther, Cat. Fishes British Museum, vol. 8, p. 490, 1870 (Madeira).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 475 (Bonaparte material).

Pteromylaeus bovina Garman, Mem. Mus. Comp. Zool., vol. 36, p. 439, 1913 (Mediterranean and neighboring Atlantic).

Pteromylaeus bovinus Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 83, 1925 (Agulhas Bank).

Myliobatis aquila (not Linnaeus) Bonaparte, Icon. Fauna Ital., Pesci., pt. 2, fasc. 2, descr., pl., fig., 1833 (Italy).

Myliobates episcopus Valenciennes, Hist. Nat. Canaries, vol. 2, pt. 2, p. 98, pl. 24, 1836–44 (type locality: Canary Islands; Algiers).

Myliobatis bonaparti Duméril, Hist. Nat. Elasmobr., vol. 1, p. 635, 1865 (type locality: Mediterranean; Algeria; types of *Myliobates episcopus*).

Head large. Snout 1⅘ in head, extended, slender, tip blunt; mouth width 3 in head; teeth in 7 rows, median 6 to 8 times wider than long, outer narrow; internasal 4⅔ in head, front nasal valves confluent; preoral length 1¾. Spiracle large, scarcely visible as viewed above.

Dorsals small, inserted close behind ends of dorsal bases, length 2¾ in head; tail 3 times disk length, with serrated spine; pectorals form broad disk, about twice wide as long; ventrals rather long or front edge 1¾ in head.

Brown above. White below.

Eastern Atlantic, Mediterranean, South Africa. The young with 7 or 8 obsolete or pale transverse whitish streaks.

1 example. A.N.S.P. Italy. C. L. Bonaparte. No. 216. Female. Length, 889 mm.

MYLIOBATIS PUNCTATUS Maclay and Macleay

Myliobatis punctatus MACLAY and MACLEAY, Proc. Linn. Soc. New South Wales, vol. 10, pt. 4, p. 675, 1885 (type locality: Admiralty and Lub or Hermit Islands).

Miliobatis punctatus MACLAY and MACLEAY, *op. cit.*, pl. 46, figs. 1, 2, 1885.

Aetobatis punctata GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 497, 1910 (copied).

Pteromylaeus punctatus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 439, 1913 (copied).—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).

Head to first gill opening 3⁹⁄₁₀ in total length. Snout 2¼ in head, long and triangularly pointed; eye about 20, 9 in snout, 7½ in interorbital, pupil vertically oval; mouth width 4¾ in head or 2½ in preoral length; 2 curtainlike flaps overlap lateral labial folds, which distinct on open mouth and lower border of labial flaps slightly notched; upper dental plates nearly twice wide as lower, formed of many longitudinal rows of teeth with median largest; on back of mouth above 7 papillae in first row, 4 in second, smaller lateral lower papillae; internarial 2⅘ in preoral length, nostrils subequal with eyes; interorbital 2⅓ in head, convex. Gill openings subequal, interspace of last pair 1⅞ in that of first pair. Spiracle about 3 times eye and as far posterior.

Dorsal slightly greater than space between spiracles, hind pectoral edge opposite center in its length or about middle of ventral length, rounded behind; tail 1⅓ in disk length, with 2 spines inserted about first fourth its length; pectorals form wide disk, length 1⁴⁄₇ its width, front edges slightly convex, hind edges concave and outer angles triangular; ventrals obtuse, width 1⅘ length.

Above greenish gray, with variable irregular white spots. Below dirty white, darker on pectorals. Disk length to hind ventral edge, 1,130 mm., tail from dorsal fin, 640 mm. (Maclay and Macleay.)

Melanesia.

Genus AETOBATUS Blainville

Aetobatus BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 122, 1816. (Type, *Raja narinari* Euphrasen, designated by Gill, Proc. U. S. Nat. Mus., vol. 17, p. 122, 1894.)

Aetobatis BLAINVILLE, Faune Française, Poissons, p. 38, 1825. (Type, *Raja narinari* Euphrasen.)

Aetobates RICHARDSON, Ichth. China Japan, p. 198, 1846. (Type, *Raja narinari* Euphrasen.)

Aetobatys DUMÉRIL, Mem. Acad. Sci. France, vol. 27, p. 145, 1856. (Type, *Raja narinari* Euphrasen.)

Stoasodon CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1416, 1849. (Type, *Raja narinari* Euphrasen, monotypic.)

Goniobatis AGASSIZ, Proc. Boston Soc. Nat. Hist., vol. 6, p. 385, 1859. (Type, *Raja flagellum* Schneider, monotypic.)

Tail long, slender, with serrated basal spine. Head prominent, narrowing downward and forward on sides. Snout narrower, produced. Teeth in single row in each jaw, fused, lower pavement produced. Front nasal valves confluent; median notch in pectoral flap. Dorsal fin on tail basally before serrated spine. Pectorals slightly falciform, not continuous forward to snout. Rostral fins separated from pectorals and at lower level on side of head. Ventrals narrow, elongate.

ANALYSIS OF SPECIES

a^1. Snout long, tapering, acute; uniform or spotted with whitish------narinari

a^2. Snout short, tapering, blunt; marked with thickly set small dark bordered spots-- ocellatus

AETOBATUS NARINARI (Euphrasen)

Raia narinari EUPHRASEN, Kon. Vet. Acad. Nya Handl. Stockholm, vol. 11, p. 217, pl. 10, 1790 (type locality: St. Bartholomieu, West Indies) (on *Narinari brasiliensibus* Marcgrave, Hist. Nat. Brasil., p. 175, fig., 1648, Brazil).

Raja narinari SCHNEIDER, Syst. Ichth. Bloch, p. 361, 1801 (Tahiti).

Myliobatis narinari BENNETT, Life of Raffles, p. 694, 1830 (Sumatra).

Aetobatis narinari MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 179, 1841 (India, Red Sea; Brazil; Surinam).—BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal).—GRAY, List fish British Museum, p. 130, 1851 (Sumatra).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 87, 1852 (Batavia, Samarang, Surabaja, Kammal); (Bengal), vol. 25, p. 9 (on *Eel tenkee* Russell), p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 11, p. 95, 1856 (Banda); Act. Soc. Sci. Ind.-Néerl., vol. 1, No. 3, p. 10, 1856 (Macassar).—GUICHENOT, Notes Île Réunion, vol. 2, p. 32, 1863.—BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 240, 1863 (Obi Island).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 641, 1865 (Brazil, Red Sea, India).—DAY, Fishes of Malabar, p. 280, 1865.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 492, 1870 (Pinang, India, Seychelles, Sumatra).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 686, 1871 (Red Sea).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Bowen, South Sea).—PETERS, Monatsb. Akad. Wiss. Berlin, 1875, p. 447, 1876 (Mauritius, Seychelles).—DAY, Fishes of India, pt. 4, p. 743, pl. 194, fig. 4, 1878.—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 64, 1879 (South Seas).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, pt. 2, p. 317, 1880 (Cape York); vol. 6, p. 381, 1881 (Cape York).—OGILBY, Proc. Linn. Soc. New South Wales, vol. 10, p. 466, 1885 (Cape Hawke, New South Wales); Cat. Fish. Australian Mus., pt. 1, p. 22, 1888 (Cape Hawke; Madras).—DAY, Fauna British India, Fishes, vol. 1, p. 59, fig. 24, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 244 (Muscat).—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Buntal and Santubong).—Duncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 199, 1904 (locality ?).—Volz, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 241, 1907 (Sumatra ?).—Lloyd, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—Stead, Fishes of Australia, p. 223, 1908.—Annandale, Mem. Indian Mus. vol. 3, p. 4, 1910 (off Madras coast).—Günther, Journ. Mus. Godeffroy, pt. 17, p. 496, 1910 (Hawaiian Islands; Samoa; Solomons).—Gilchrist and Thompson, Ann. South African Mus., vol. 11, p. 56, 1911 (Natal).—Pearson, Ceylon Administr. Rep. 1912–13, p. E5.—Southwell, Ceylon Administr. Rep., 1912–13, pp. E41, E44, E48, E50.—Weber, *Siboga* Exped., Fische, vol. 57, p. 604, 1913 (Lombok).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 9, 1913 (Mekran; Oman).—Bamber, Journ. Linn. Soc. London, vol. 31, Zool., p. 478, 1915 (Sudanese Red Sea).—Pearson, Ceylon Administr. Rep., 1915–18, pp. F10, F13, F14.—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, pt. 3, p. 289, 1916 (synonymy).—Malpas, Ceylon Administr. Rep., 1921, p. E5.—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 83, pl. 5, fig. 1, 1925.—McCulloch, Fishes of New South Wales, ed. 2, p. 13, pl. 3, fig. 42a, 1927.—Pillay, Journ. Bombay Soc. Nat. Hist., vol. 33, p. 353, 1929 (Travancore).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^e note, p. 79 (Mekong, Saigon River), p. 175, 1929 (Cochin China).

Aetobatis narrinari Steindachner, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 70, p. 519, 1901 (Laysan).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).

Aetobates narinari Sauvage, Hist. Nat. Madagascar, Poiss., p. 510, 1891.

Aetobatus narinari Seale, Occ. Pap. Bishop Mus., vol. 1, No. 5, pp. 20, 22, 1902 (Honolulu).—Jenkins, Bull. U. S. Fish Comm., vol. 22 (1902), p. 421, 1904 (Honolulu).—Snyder, Bull. U. S. Fish Comm., vol. 22, 1902, p. 515, 1904 (Honolulu).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 475, (no data).—Gudger, Carnegie Inst. Washington, Publ. No. 183, p. 241, pls. 1–10, 1914 (historical).—Ogilby, Commerc. Fish. Fisher. Queensland, p. 46, 1915 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 89, 1916 (Moreton and Wide Bays).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 194 (Durban Bay, Natal).—Fowler and Ball, Bishop Mus., Bull. 26, p. 5, 1925 (Johnston Island).—Jordan, Evermann, Tanaka, Proc. California Acad. Sci., ser. 4, vol. 16, p. 651, 1927 (Honolulu).—Fowler, Mem. Bishop Mus., vol. 10, p. 26, 1928 (Honolulu and Johnston Island).—McCulloch, Austral. Mus. Mem., No. 5, pt. 1, p. 30, 1929 (reference).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (Tropical Atlantic); Hong Kong Nat., vol. 1, p. 186, 1930 (Indian Ocean, Hawaii, Atlantic); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).—Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 15, 1931 (Kagoshima).—Chevey, Inst. Oceanogr. Indochine, 19^e note, p. 7, 1932 (Cochinchina).—Wang, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 115, fig. 12, 1933 (Yenting).—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 13, 1934 (Taytay Bay, Palawan; Sulu Islands).—Tortonese, Boll. Mus. Zool. Anat Comp. Torino, ser. 3, vol. 45, No. 63, p. 12, 1935–36 (Mar Rosso).—Herre, Field. Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 24, 1936 (Tahiti; New Hebrides; Solomons; Dutch New Guinea; Celebes; Borneo; Philippines).—Fowler, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 137, fig. 57, 1936 (tropical Atlantic and eastern Pacific).—Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 17, 1937 (reference).—Suvatti, Index Fish. Siam, p. 7, 1937 (Gulf of Siam).—Fowler, List Fish. Malaya, p. 19, 1938 (reference).

Stoasodon marinari Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1416, 1849 (Pinang, Malay Peninsula, Singapore).—Jerdon, Madras Journ. Lit. Sci., vol. 17, p. 149, 1851.—Jordan and Evermann, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903), p. 49, fig. 7, 1905 (Honolulu; Hilo).—Jordan and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 4, 1907 (Cavite).—Jordan, Journ. Pan Pacific Inst., vol. 2, No. 4, p. 3, 1927 (Samoa).

Raia flagellum Schneider, Syst. Ichth. Bloch, p. 361, pl. 75, 1801 (type locality: Coromandel).

Aetobatis flagellum Müller and Henle, Syst. Beschr. Plagiostomen, p. 180, 1841 (India, Red Sea).—Gray, List fish British Museum, p. 130, 1851 (reference).—Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 82, 1852 (Indian Ocean, Red Sea, China); (Bengal), vol. 25, p. 82, 1853 (reference).—Blyth, Journ. Asiatic Soc. Bengal, vol. 29, p. 37, 1860 (Calcutta).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 642, 1865 (Sea of the Indies).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 246 (note), 1871 (Red Sea).—Annandale, Mem. Indian Mus., vol. 2, p. 57, 1909 (off Orissa and mouth Chilka Lake).—Garman, Mem. Mus. Comp. Zool., vol. 36, p. 44, 1913 (Red Sea and Indian Ocean).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (Hawaii; Indian Ocean).

Aetobates flagellum Richardson, Ichth. China Japan, p. 198, 1846 (China Seas, Macao).

Aetobatus flagellum Bleeker, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 82, 1852 (China).

Raja guttata (not Schneider, 1801) Shaw, General zoology, vol. 5, p. 285, pl. 142, 1804 [type locality: Madagascar; Coromandel; Brazil (on *Eel tenkee* Russell, Fishes of Coromandel, vol. 1, p. 5, pl. 8, 1803, Vizagapatam)].

Aetobatis guttata Annandale, Mem. Indian Mus., vol. 2, p. 56, pt. 1909.

? *Aetobatus sinesis* Blainville, Bull. Soc. Philom., Paris, vol. 8, p. 112, 1816 (name only).

? *Aetobatus filicaudatus* Blainville, Bull. Soc. Philom., Paris, vol. 8, p. 112, 1816 (name only).

? *Aetobatus forsteri* Blainville, Bull. Soc. Philom., Paris, vol. 8, p. 112, 1816 (name only).

Raia quinqueaculeata Quoy and Gaimard, Voy. *Uranie*, Zool., p. 200, pl. 43, fig. 3, 1824 (type locality: Guam).

Myliobatis eeltenkee Rüppell, Neue Wirbelth., Fische, p. 70, pl. 19, fig. 3, 1835 (teeth) (type locality: Djidda and Massaua).

Aetobatis indica Swainson, Nat. Hist. Animals, vol. 2, p. 321, 1839 (on *Eel tenkee* Russell).

Myliobatis macroptera McClelland, Calcutta Journ. Nat. Hist., vol. 1, p. 60, pl. 2, fig. 1, 1841 (type locality: Bengal).

Raja edentula (Forster) Lichtenstein, Descr. Anim. Forster, p. 227 (Tahiti), p. 256, 1844 (type locality: Tanna).

Aetobatis latirostris Duméril, Arch. Mus. Hist. Nat. Paris, vol. 10, p. 242, pl. 20, fig. 1, 1858 (type locality: Gaboon coast); Hist. Nat. Elasmobr., vol. 1, p. 643, 1865 (type).

Goniobatis meleagris Agassiz, Proc. Boston Soc. Nat. Hist., vol. 6, p. 385, 1859 (type locality: Hawaiian Islands).

Aetobatis laticeps Gill, Ann. Lyceum Nat. Hist. New York, vol. 8, 1865, p. 137, 1861 (type locality unknown).

Aetobatis tenuicaudatus Hector, Trans. New Zealand Inst., vol. 9, p. 468, 1877 type locality: Wellington Harbour).—McCulloch, Biol. Res. *Endeavour*, vol. 2, pt. 3, p. 86, text fig. 3, 1914 (dentition).

Myliobatis tenuicaudatis Hector, Trans. New Zealand Inst., vol. 9, pl. 10, figs. a–e, 1877. (Error.)

Myliobatis tenuicaudatus Waite, Rec. Canterbury Mus., vol. 1, No. 2, p. 152, pl. 23, 1909 (off Poverty Bay and Bay of Plenty).

Myliobatis aquila (not Linnaeus) Kent, Great Barrier Reef, p. 103, 1893 (Elliott Island).

Diccrobatis eregoodoo (not Cantor) Kent, Great Barrier Reef, p. 370, 1893 (part).

Depth 4⅕ to 4¾ in disk length; head 2⅞ to 3; disk length 1½ to 1⅘ in its width, 4 in tail. Snout 1⅞ to 2 in head, forms pointed lobe at low level in front; eye 8 to 10½, 4¼ to 5 in snout, 6¾ to 7¾ in interorbital; dentary width 3⅔ to 4 in head; teeth uniserial, lower pavement projecting slightly; lips papillose; nostrils each simple deep slit, internarial 1¼ to 1⅖ in dentary width; interorbital 1½ to 1⅘ in head, broad, nearly level or only very slightly convex. Gill openings subequal or last smallest, equidistant. Spiracles large, deep, oblique apertures, twice eye diameter.

Skin smooth. Caudal spine (single in my specimens) 1⅔ to 1⅞ in interorbital.

Dorsal length 3¾ to 4⅛ in head; no anal; tail very long, whiplike; pectoral forms very wide disk, front edges slightly convex and hind edges slightly concave, acute at outer angle; ventral 1⅓ to 1⅖ in head, rather narrow and obtuse or convex terminally.

Back brown or olive brown. Scattered white, creamy or gray-white spots scattered principally over last half of disk, largest toward middle of disk, and become little more numerous and smaller marginally behind. All spots well contrasted, though ill defined or without sharp borders. Few spots may extend on front of back, on ventrals and base of tail, none on head or greater part of tail. Under surface whitish, outer angles of pectorals marginally little brownish.

Red Sea, Arabia, Natal, Madagascar, Seychelles, India, Ceylon, Malay Peninsula, Pinang, Singapore, East Indies, Philippines, Cochin China, China, Queensland, New South Wales, Melanesia, Micronesia, Polynesia, Hawaiian group. A well-marked species known by its uniform or ill-defined white spots chiefly on the posterior portion of the disk. These quite variable and sometimes said to be entirely absent. The white spots are not known to extend on the head. As here understood *Aetobatis narinari* (Euphrasen) also ranges through the tropical Atlantic and along the American shores in the tropical eastern Pacific.

4656. Manila Harbor. June 13, 1908. Length, 1,020 mm.
8292. Sorsogon market. March 12, 1909. Length, 1,330 mm.
9054. Abuyog, Leyte. July 26, 1909. Length, 1,393 mm.

U.S.N.M. No. 71907. Okinawa, Riu Kiu. *Albatross* collection. Length, 1,330 mm. Spots all small and of scattered appearance, inconspicuous, not extending on head or nape and anterior rows just before middle of disk tending to form broken horizontal pale lines.

AETOBATUS OCELLATUS (Kuhl)

Myliobatis ocellatus KUHL, Algemein Konst Letterbode, p. —, 1823 (type, locality: Java).—VAN HASSELT, Bull. Sci. Nat. Férussac, vol. 2, p. 90, 1824 (Java).

Aetobatus ocellatus GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 442, 1913 (Indian Ocean).

Depth 5¾ in disk length; head 3; disk length 2⅘ in its width, 3¼ in tail. Snout 2⅛ in head, forms broadly obtuse depressed lobe below and at low level in front; eye 9⅔, 5 in snout, 6¼ in interorbital; dentary width 3⅞ in head; teeth uniserial, lower pavement projects slightly; lips papillose; nostrils each deep simple slit, internarial 1½ in dentary width; interorbital 1¾ in head, broad, slightly convex. Gill openings subequal or last smallest, equidistant. Eye 1¾ in spiracle, which wide and deep.

Skin smooth. No caudal spine.

Dorsal length 4 in head; no anal; tail very long, whiplike; pectoral forms very wide disk, front edges nearly straight, hind edge slightly concave, acute at outer angle; ventral 1⅓ in head, expanded terminally and convex behind.

Back brown, marked with many scattered, close-set, whitish spots, becoming smaller about disk edges. Spots also extend well over head, dorsal, ventral and base of tail. Tail largely dusky. Under surfaces dusky.

East Indies, Indian Ocean. I identify the specimen described above with this species as all its white spots appear to have formerly been more brilliant, contrasted and apparently ocellated.

U.S.N.M. No. 39987. South Sea Islands. Australian Museum. Length, 1,100 mm.

Genus RHINOPTERA Cuvier

Rhinoptera (Kuhl) CUVIER, Règne animal, ed. 2, vol. 2, p. 401, 1829. (Type, *Myliobatis marginata* GEOFFROY SAINT-HILAIRE, designated by Fowler, Geol. Surv. New Jersey Bull. 4, p. 101, 1911.)

Zygobatis AGASSIZ, Poissons fossiles, vol. 3, p. 79, 1838. (Type, *Myliobatis jussieui* Cuvier, monotypic.)

Zygobates AGASSIZ, loc. cit., vol. 3. p. 328, 1843. (Type, *Myliobatis jussieui* Cuvier.)

Trikeras HARLESS, Abh. Nat. Phys. Kl., vol. 5, p. 841, 1850. (Atypic.) (Type, *Myliobatis marginata* Geoffroy Saint-Hilaire.)

Mylorhina GILL, Ann. Lyceum Nat. Hist. New York, p. 139, 1865. (Type, *Rhinoptera lalandii* Müller and Henle, orthotypic). (*Mylorhinus* Boisduval, 1835, in Coleoptera not involved.)

Micromesus GILL, Ann. Lyceum Nat. Hist. New York, p. 139, 1865. (Type, *Rhinoptera adspersa* Müller and Henle, orthotypic.)

Trycera (*Koch*) DÖDERLEIN, Manuale ittiologico Mediterraneo, vol. 3, p. 242, 1885. (Type *Myliobatis typica* Koch=*Myliobatis marginata* Geoffroy Saint-Hilaire.) (Name in synonymy.)

Body, head, and pectorals formed as wide lozenge-shaped disk. Tail long, slender, whiplike, with basal serrated spine. Cranium prominent. Eyes prominent, lateral. Teeth wide, angular, flat, in pavement, median row widest. Spiracles large, behind eyes, open laterally. Dorsal fin above basal part of tail. Pectorals greater developed in front half. Pair of rostral fins, not joined with front of skull and not continuous at sides of head with pectorals.

ANALYSIS OF SPECIES

*a*¹. Teeth in 7 rows; skin smooth_____________________________________ javanica
*a*². Teeth in 9 rows above.
  *b*¹. Median row of teeth and second on each side 3 times wide as long, narrower than row each side of median__________________________ adspersa
  *b*². Median row of teeth 8 times wide as long, next row 4 times____ jayakari

RHINOPTERA JAVANICA Müller and Henle

Rhinoptera javanica MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 182, pl. 58, 1841 (type locality: Java).—BLEEKER, Verh. Batav Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal).—GRAY, List fish British Museum, p. 132 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 89, 1852 (Batavia, Samarang, Soerabaya).—DUMÉRIL, Hist. Nat. Elasmobr., vol 1, p. 647, 1865 (Malabar).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 494, 1870 (types of *Rhinoptera affinis* and *Rhinoptera smithii*).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 120, 1874 (China).—DAY, Fishes of India, pt. 4, p. 744, pl. 195, fig. 4 (teeth), 1878 (Kurrachee); Fauna British India, Fishes, vol. 1, p. 61, fig. 25 (teeth), 1889.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Moratabas).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 194, 1904 (locality ?).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, p. E50.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 446, 1913 (Java and India).—PEARSON, Ceylon Administr. Rep., 1915–18, p. F10.—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 465, 1924 (TaleSap, Singora).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1ᵉ note, p. 6, 1926 (Gulf of Siam).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 354, 1929 (Travancore).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 597, 1930 (Hong Kong); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).—UMALI, Philippine Dept. Agri. Comm. Pop. Bull. 6, p. 46, 1936 (Manila).—ROXAS and MARTIN, Dept. Agri. Comm. Manila, Tech. Bull. 6, p. 17, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 8, 1937 (reference).—FOWLER, List Fish. Malaya, p. 20, 1938 (reference).

Rhinoptera smithii GRAY, List fish British Museum, p. 494, 1851 (type locality: "Antarctic Seas").

Rhinoptera truncata (Van Hasselt) BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 89, 1852 (East Indies). (Name in synonymy.)

?*Rhinoptera affinis* BLEEKER, Verh. Maatsch. Wet. Haarlem, ser. 2, vol. 18, p. 19 (fetus), 1863 (type locality: Guinea).

Depth 4⅓ to 5 in disk length to hind pectoral edge; head 2¾ to 4; disk length 1⅔ to 1¾ in its width, 3⅛ in tail; head width subequal with its length. Snout width subequal with interorbital, with shallow median notch, tips of rostral fins showing as viewed from above; eye 6 to 7½ in head, 4⅔ to 5¾ in interorbital; mouth width 1⅔ to 1¾ in head; upper lip with edge fringed, lower papillate; teeth in 7 rows in jaws, median row ⅓ to 7 times as wide as those in lateral rows; outermost row of teeth smallest, wide as long; internarial width 1⅖ in mouth width; interorbital 1⅕ to 1¼ in head, broad, slightly convex. Gill openings moderate, equidistant, last smallest. Spiracles large, twice eye and closely posterior to eye.

Skin smooth. Caudal spine 1½ to 1⅔ in interorbital.

Dorsal length 1⅘ to 1⅞ in interorbital; no anal; tail long, slender, whiplike; pectorals falcate, front edges convex, hind edges concave, tips acuminate; ventrals rather long, narrow, end in obtuse inner lobe.

Uniform brown above, below white.

India, Ceylon, East Indies, China.

This species has a much longer tail than Garman describes. It differs from the other Indo-Pacific species *Rhinoptera adspersa* Müller and Henle and *Rhinoptera jayakari* Boulenger in the possession of but 7 rows of teeth in each jaw.

6763. Manila market. April 29, 1909. Length, 660 mm., tail end broken.
6764. Manila market. April 29, 1909. Length, 1,010 mm.

RHINOPTERA ADSPERSA Müller and Henle

Rhinoptera adspersa (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 183, 1841 (India).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1418, 1849 (Pinang).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 149, 1851.—GRAY, List fish British Museum, p. 132, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 82, 1852 (Indian Ocean); (Bengal), vol. 25, p. 82, 1853 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 648, 1865 (type).—GÜNTHER, Cat. Fishes British Museum, vol. 8, p. 494, 1870 (East Indies).—DAY, Fishes of India, pt. 4, p. 744, 1878 (Madras); Fauna British India, Fishes, vol. 1, p. 61, 1889.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 447, 1913 (Indian Ocean).

Snout short and broad; upper teeth in 9 rows, median row and second on each side about equal, each of teeth less than 3 times broad as long, narrower than separating rows; lower teeth in 7 rows, median row wider, other rows narrowing to outer.

Back rough with small stellate based spines.

Dorsal origin little behind ventral bases, tail more than 3 times disk length; pectorals form disk twice wide as long, front edges nearly straight, hind edges concave, outer angles pointed, hind angles straight; cephalic fins rounded, not prolonged.

Greenish brown above, lighter below. Length, 991 mm. (Müller and Henle; Duméril.)

India, Pinang.

RHINOPTERA JAYAKARI Boulenger

Rhinoptera jayakari BOULENGER, Ann. Mag. Nat. Hist., ser. 6, vol. 15, p. 141, 1895 (type locality: Muscat, Arabia).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 448, 1913 (copied).

Head long as wide. Snout emarginate; mouth width nearly equals preoral length; teeth in 9 rows, those of median upper row 8 times wide as long and nearly twice wide as those adjacent; median lower teeth 6 times wide as long and 1½ wide as adjacent one.

Skin smooth.

Tail 2½ in total length; disk 1¾ times broad as long.

Blackish above, whitish beneath. Length, 740 mm. (Boulenger.)

Arabia. I have no way of distinguishing the imperfectly noticed *Rhinoptera neglecta* Ogilby, which follows.

RHINOPTERA NEGLECTA Ogilby

Rhinoptera neglecta OGILBY, Mem. Queensland Mus., vol. 1, p. 32, 1912 (type locality: Moreton Bay, Queensland); vol. 5, p. 89, 1916 (copied).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).

Rhinoptera javanica (not Müller and Henle) DEVIS, Proc. Roy. Soc. Queensland, vol. 2, pt. 1, p. 12, 1885 (Moreton Bay).

Nine series of teeth in each jaw, those of median upper series 8 times wide as long and 1⅖ times as wide as adjacent series; middle lower teeth little wider than upper. Disk more than twice broad as long. Median notch of snout deep. Disk width, 860 mm.

Queensland. "This unique Australian specimen is unfortunately in such wretched condition as to preclude a more detailed description."

Family MOBULIDAE

Head, body, and pectorals form partly rhomboid disk, wider than long. Tail slender, whiplike. Head broad, flat. Eyes large, lateral. Mouth large, transverse. Teeth small, numerous, in pavement. Gill openings large. Spiracles moderate, behind orbits. Small triangular dorsal on tail, above and between ventrals. Pectorals wide, triangular, not continuous at side of head, acute angled laterally and posteriorly. Cephalic fin as separated section of pectorals, extended forward as hornlike extension from each side. Ventrals small, between pectorals.

Gigantic rays, remarkable for their great width, which sometimes reaches 610 cm. with a weight of 4 tons. They are frequent in tropical or subtropical seas and are usually found floating near the surface, especially in situations where vast areas of plankton and neckton occur. Their weak dentition and modified branchial apparatus probably serve to strain out the minute organisms, like the branchial strainers of *Cetorhinus* and *Rhincodon*, as the water flows through their gill slits. Owing to their immense size and the fear of native fishermen, specimens are seldom brought to museums intact. Like other large marine animals our knowledge of them is therefore very fragmentary or unsatisfactory and often confused or erroneous.[10] So far as known they are viviparous, producing but several young in a season.

ANALYSIS OF GENERA

*a*¹. MOBULINAE. Mouth inferior; teeth in both jaws or at least in upper jaw. Mobula

*a*². CEPHALOPTERINAE. Mouth anterior or terminal; teeth usually only on lower jaw, sometimes in both jaws---------------------------------- Manta

Genus MOBULA Rafinesque

Mobula RAFINESQUE, Indice d'ittiologia siciliana, pp. 48, 61, 1810. (Type, *Mobula auriculata* Rafinesque, monotypic.)

Apterurus RAFINESQUE, Indice d'ittiologia siciliana, pp. 48, 62, 1810. (Type, *Raja fabroniana* Lacépède, monotypic.)

Apturus CUVIER, Hist. Nat. Poiss., vol. 1, p. 215, 1828. (Type, *Raja fabroniana* Lacepède.)

Cephalopterus (not Geoffroy Saint-Hilaire 1809) (Duméril) RISSO, Ichth. Nice, p. 14, 1810. (Type, *Raja giorna* Lacépède=*Raja cephaloptera* Schneider, virtually tautotypic.)

Cephaloptera (Duméril) CUVIER, Règne animal, vol. 2, p. 138, 1817. (Type, *Raja cephaloptera* Schneider, monotypic.)

Cephalopteram GRIFFITH and SMITH, Animal Kingd. Cuvier, Griffith's, vol. 10, p. 17, 1834. (Type, *Raja giorna* Lacépède.)

Dicerobatus BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816. (Type, *Raja mobular* BONNATERRE, designated by Jordan and Evermann, Genera of fishes, pt. 1, p. 95, 1917.)

Dicerobatis BLAINVILLE, Faune Française, Vertebr., p. 40, 1825. (Type, *Raja mobular* Bonnaterre.)

Diarobatus AGASSIZ, Nomenclat. Zool., Pisces, p. 22, 1845. (Type, *Raja mobular* Bonnaterre.)

Pterocephalus SWAINSON, Nat. Hist. Animals, vol. 1, pp. 170, 174, 1838. (Type, *Raja cephaloptera* Schneider.) (*Pterocephalus* Schneider 1887, Linstow 1899, Raw 1908, in invertebrates precluded.)

Pterocephala SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, p. 319, 1839. (Type, *Raja giorna* Lacépède, monotypic.)

Tail slender, whiplike, with or without serrated spine. Head broad, flat, truncate. Rostrum short, broad, sharp-edged anteriorly. Mouth wide, inferior. Teeth on both jaws, small, numerous, in pavement. Internarial space wide. Dorsal fin between ventrals. Rostral fins moderate, distinct from pectorals, directed forward and obliquely downward but rolled from below outward in subcylindrical roll when not in use.

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[10] Gill, Smithsonian Misc. Coll., vol. 52, p. 155, figs. 1908.

ANALYSIS OF SPECIES

a^1. Serrated caudal spine present -- japanica
a^2. No serrated caudal spine -- diabolus

MOBULA JAPANICA (Müller and Henle)

Cephaloptera japanica Müller and Henle, Syst. Beschreib. Plagiostomen, p. 185, 1841 (type locality: Japan).

Cephaloptera japonica Schlegel, *in* Siebold's Fauna Japonica, Poiss., pt. 15, p. 310, 1850 (Japan).—Gray, List fish British Museum, p. 134, 1851 (reference).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Japan).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 659, 1865 (copied).—Günther, Journ. Mus. Godeffroy, pt. 17, p. 498, 1910 (reference).

Dicerobatis japonica Günther, Cat. Fishes British Mus., vol. 8, p. 496, 1870 (compiled).

Aodon japonicus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 43, 1901 ("Japan").

Mobula japonica Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 666, 1903 (Misaki).—Izuka and Matsuura. Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Tokyo).—Fowler, Bishop Mus. Bull. 38, p. 3, pl. 1, figs. a–c, 1927 (Honolulu).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Mokpo, Korea).—Fowler, Mem. Bishop Mus., vol. 10, p. 26, 1928 (compiled).—Tanaka, Jap. Fish. Life Colours, No. 36, 1933.

Mobula japanica Garman, Mem. Mus. Comp. Zool., vol. 36, p. 450, 1913 (Japan).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (Japan; Hawaii).—Whitley, Australian Zoologist, vol. 8, pt. 3, p. 187, 1936 (compiled).

I reported an incomplete specimen in 1927 obtained in the Honolulu markets now in the collections of the Bishop Museum.

Teeth bands extend to mouth angles, 84 rows above, 101 rows below.

Head above dark dusky brown, below creamy white. Eye pale. Edge of lower lip and upper snout edge neutral gray, also inner surfaces of cephalic fins.

MOBULA DIABOLUS (Shaw)

Raja diabolus Shaw, General zoology, vol. 5, p. 291, 1804 (on *Eregoodoo-tenkee* Russell, Fishes of Coromandel, vol. 1, p. 5, pl. 9, 1803, type locality: Vizagapatam).—Swain, Proc. Acad. Nat. Sci. Philadelphia, 1882, p. 308 (on Shaw).

Mobula diabolus Whitley, Australian Zoologist, vol. 8, pt. 3, p. 185, 1936 (Brisbane; India; New Hebrides).

? *Raja bankiana* Lacépède, Hist. Nat. Poiss., vol. 2, p. 115, pl. 5, fig. E, 1800 (type locality: East Indies).

Raia eregoodoo-tenkee Cuvier, Règne animal, vol. 2, p. 402, 1829 (on *Eregoodoo tenkee* Russell, Fishes of Coromandel, vol. 1, p. 5, pl. 9, 1803, Vizagapatam).

Mobula eregoodoo-tenkee GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 451, 1913 (Indian Seas, Malay Archipelago, Red Sea).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1918, p. 2 (Philippines); vol. 79, p. 256, 1927 (same example); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference); List Fish. Malaya, p. 20 (246), 1938 (reference).

Mobula eregoodoo-tenke FOWLER, Copeia, No. 58, p. 62, 1918 (same example).

Dicerobatis eregoodoo CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1420, 1849 (type locality: Pinang).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 149, 1851.—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 9, 1853 (on *Eregoodoo tenkee* Russell).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 497, 1870 (Indian Seas).—DAY, Fishes of India, pt. 4, p. 744, pl. 193, fig. 1, 1878 (Jerdon's example); Fauna British India, Fishes, vol. 1, p. 62, fig. 26, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 244 (Muscat).—KENT, Great Barrier Reef, p. 370, pl. 48, figs. 2–3, 1893 (Palm Islands).—LLOYD, Rec. Indian Mus., vol. 2, p. 179, text, fig. 2 (teeth), pl. 4, fig. 1, 1908 (Madras).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 9, 1913.

Dicerobatus eregoodoo WOOD JONES, Proc. Zool. Soc. London, 1909, p. 144 (Cocos Keeling Atoll).

Dicerobatis ereegoodoo PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 354, 1929 (Travancore).

Cephaloptera eregoodoo DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 655, pl. 6, figs. 2–3 (teeth), 1865 (compiled).

Mobula eregoodoo OGILBY, Mem. Queensland Mus., vol. 5, p. 90, 1916 (Moreton Bay); vol. 6, p. 97, 1918 (Moreton Bay).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—MCCULLOCH, Australian Mus. Mem., vol. 5, p. 31, 1929 (Queensland).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 17, 1937 (reference).

Cephaloptera tatraniana VAN HASSELT, Allgem. Konst- en-Letterb., vol. 1, p. 316, 1823 (on *Eregoodoo tenkee* Russell, 1803).

Cephaloptera kuhlii (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 185, pl. 59, fig. 1, 1841 (type locality: India).—GRAY, List fish British Museum, p. 134, 1851 (reference).—BLEEKER, Act. Soc. Sci. Indo-Néerl., vol. 3, no. 7, pp. 1, 6, 1858 (Amboina).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 654, pl. 6, figs. 9–9a (teeth), 1865 (type).—VORDERMANN, Nat. Tijdschr. Nederland. Indië, vol. 56, p. 40, 1897.

Dicerobatis kuhlii BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 82, 1853 (reference).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 497, 1870 (type; Zanzibar).—DAY, Fishes of India, pt. 4, p. 745, 1878; Fauna British India, Fishes, vol. 1, p. 63, 1889.—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.—WEBER, in Semon's Zool. Forsch. Reis. Australia, vol. 5, p. 276, 1895 (Ambon).

Mobula kuhli MILLAR, Zoologist, No. 694, p. 145, pl. 1, 1899 (Durban).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 86, pl. 5, fig. 2, 1925 (Natal).

Mobula kuhlii GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 452, 1913 (Indian Ocean, East Indies, Japan).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).—WHITLEY, Australian Zool., vol. 8, pt. 3, p. 186, 1936 (compiled).

Cephaloptera olfersii (not Müller) GRAY, List fish British Museum, p. 133, 1851 (Indian Ocean).

Dicerobatis monstrum KLUNZINGER, Vehr. zool.-bot. Gess. Wien. vol. 21, p. 687, 1871 (type locality: Red Sea).

Mobula monstrum WHITLEY, Australian Zool., vol. 8, pt. 3, p. 186, 1936 (compiled).

Dicerobatis draco Günther, Ann. Mag. Nat. Hist., ser. 4, vol. 10, p. 422, 1872 (type locality: Misol).

Mobula draco Garman, Mem. Mus. Comp. Zool., vol. 36, p. 451, 1913 (Misol).—Fowler, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).—Whitley, Australian Zool., vol. 8, pt. 3, p. 186, 1936 (compiled).

Dicerobatis thurstoni Lloyd, Rec. Indian Mus., vol. 2, p. 179, fig. 3, pl. 4, fig. 2, 1908; vol. 26, pt. 6, p. 9, 1913 (type locality: Mekran and Oman).

Mobula thurstoni Whitley, Australian Zool., vol. 8, pt. 3, p. 187, 1936 (copied).

Depth 5⅔ in disk measured from median concavity of snout to hind pectoral edge; head 4; disk length 1¾ in its width, 1⅗ in tail; head width little greater than its length. Tip of rostral flap to eye 1¼ in head; eye 5¾, 6⅘ in interorbital; mouth width 1¼ in head; teeth in 50 to 52 rows in jaws; internarial space slightly less than mouth width; interorbital slightly greater than head length, nearly level or only very slightly convex. Gill openings large, second to fourth largest or 4⅖ in interorbital, last ⅘ of third. Spiracle small, inconspicuous below ridge and in deep wide groove, about size of pupil.

Skin smooth. No caudal spine.

Dorsal length 2¼ in interorbital, ends little before hind ventral ends; no anal; tail long and whiplike; pectorals falcate, angles acute and rather sharp, front edges of fin nearly straight and hind edges concave; ventrals small, rather long, ends obtuse.

Brown above, paler to whitish below, with pectorals terminally little brownish.

Red Sea, Arabia, India, Pinang, East Indies, Philippines, Queensland. Although Garman has accepted 4 species in this genus without a serrated caudal spine I cannot believe that the distinctions, based on the width of the dental bands and the length of the tail are satisfactory. Day gives the dentition as 340 upper and 360 lower teeth in jaw 12 inches across gape and 5,490 mm. (18 feet) wide; one 4 inches across jaws had 240 rows above and 244 below; Cantor gives 80 teeth above and 95 below for an example 30 inches (663 mm.) wide. Garman gives the teeth in *Mobula kuhlii* as 44 rows above and 54 below in an example 420 mm. wide. Duméril separates *Cephaloptera kuhlii* on the dental plate entire behind and with but 36 to 38 rows of teeth, while in the present species he gives the dental plate emarginate behind and the rows of teeth about 80. As he had Müller and Henle's type of the former he gives the disk width 740 mm. In Günther's *Dicerobatis draco* the disk is 384 mm. wide and the upper teeth are said to be in 46 series. It was supposed by Garman to differ in the longer tail, which about equals 2⅘ disk lengths.

5705. Manila market. May 4, 1908. Length, 1,038 mm.

1 example. A.N.S.P. Philippines. Commercial Museum of Philadelphia. Disk length, 254 mm.

Genus MANTA Bancroft

Manta Bancroft, Zool. Journ., vol. 4, p. 144, 1828–29. (Type, *Cephalopterus manta* Bancroft, monotypic).

Ceratoptera Müller and Henle, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 118. (Atypic; Arch. Naturg., 1837, p. 401.) (Type, *Cephalopterus giorna* (not Lacépède) Lesueur, virtual orthotype.)

Brachioptilon Newman, Zoologist, vol. 7, p. 2396, 1849. (Type, *Brachioptilon hamiltoni* Newman, monotypic.)

Diabolicthys Holmes, Proc. Elliott Soc. Nat. Hist., vol. 1, p. 39, 1856. (Type, *Diabolicthys elliotti* Holmes, monotypic).

Diabolichthys Marshall, Nomenclat. Zool., p. 72, 1877. (Type, *Diabolicthys elliotti* Holmes.)

Daemomanta Whitley, Rec. Austrailian Mus., vol. 18, No. 6, p. 327, 1932. (Type, *Manta alfredi* Stead, orthotypic.)

Desmomanta Fowler, Mem. Bishop Mus., vol. 11, No. 6, p. 386, 1934. (Type, *Manta alfredi* Stead.) (Error.)

Indomanta Whitley, Australian Mus. Mag., vol. 6, p. 11, 1936. (Type, *Indomanta tombazii* Whitley, orthotypic.)

Head greatly depressed, broad, flat, truncate. Rostrum short, broad. Eyes prominent, lateral. Mouth large, very wide, straight, anterior or terminal with narrow edges to jaws. Teeth present only as lower dental plate, very small, close-set, numerous. Internarial very wide. Gill openings wide. Skin rough with small prickles. Rostral fins distinct from pectorals, directed or rolled forward. Small dorsal between ventrals. Tail slender, whiplike, without serrated spine on caudal. Pectorals form wide disk, greatly wider than long, outer angles acute.

Giant rays of tropical seas and though several species have been described perhaps referable to one or two species. Fossil fragments also have been referred to the genus.

MANTA BIROSTRIS (Walbaum)

Raja birostris Walbaum, Artedi Pisc., vol. 3, p. 535, 1792 (on *Diabolus marinus* Willoughby, Hist. Pisc. Append., p. 5, pl. 9, fig. 3, 1686; no type locality).—*Divel* Pennant, Arctic zoology, vol. 2, pt. 4, p. 354, 1792, copied.—Catesby, Nat. Hist. Carolina, Append., p. 32, 1771 (type locality: Carolina).

Manta birostris Fowler. Occ. Pap. Bishop Mus., vol. 8, No. 7, p. 375, 1923 (Honolulu); Bishop Mus., Bull. 28, p. 4, pl. 1, figs. d–g, 1927 (Fanning Islands); Mem. Bishop Mus., vol. 10, p. 26, 1928 (Honolulu, off Oahu); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 508, 1930 (Fanning and Hawaiian Islands); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (on Ogilby's New Hebrides *Ceratoptera*).—Herre, Field Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 25, 1936 (Cocos Island; Galapagos).—Whitley, Australian Zool., vol. 8, pt. 3, p. 179, 1936 (compiled).

Raja banksiana Lacépède, Hist. Nat. Poiss., vol. 2, p. 105, pl. 5, fig. 3, 1800 (type locality: East Indies).

Manta? banksiana Whitley, Australian Zool., vol. 8, pt. 3, p. 180, 1936 (compiled; Nauru and Solomons).

Raia fimbriata Lacépède, Hist. Nat. Poiss., vol. 4, pp. 671, 677, pl. 16, fig. 3, 1802 (type locality: North Atlantic Ocean).

Raja manatia SCHNEIDER, Syst. Ichth. Bloch, p. 364, 1801 (type locality: Tropical America).

Cephalopterus vampyrus MITCHILL, Ann. Lyceum Nat. Hist. New York, vol. 1, p. 23, pl. 2, fig. 1, 1824 (type locality: Near entrance to Delaware Bay).

Cephaloptera giorna (not Lacépède) LESUEUR, Journ. Acad. Nat. Sci. Philadelphia, vol. 4, p. 115, pl. 6, 1824 (type locality: Georgia).

Raia cornuta LESUEUR, op. cit., p. 120 (on Catesby).

Cephalopterus manta BANCROFT, Zool. Journ., vol. 4, p. 453, 1828–29 (type locality: Jamaica).

Manta americana americana BANCROFT, op. cit., p. 454 (type locality: Jamaica).

Ceratoptera lesueurii SWAINSON, Nat. Hist. Animals, vol. 2, p. 320, fig. 100, 1839 (on LeSueur 1824).

Ceratoptera johnii MÜLLER and HENLE, Syst. Beschr. Plagiost. p. 186, pl. 49, 1841 (type locality: Jamaica).

Ceratoptera ehrenbergii MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 187, 1841 (type locality: Red Sea).—GRAY, List Fish Brit. Mus., p. 134, 1851 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 661, 1865 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 498, 1870 (compiled).—KLUNZINGER, Vehr. zool. bot. Ges. Wien, vol. 21, p. 687, 1871 (Red Sea).—DAY, Fishes of India, pt. 4, p. 745 (not woodcut), 1878.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Moratabas).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21 (1903), p. 194, 1904 (Jeram).

Manta ehrenbergii GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 455, 1913 (compiled).—WHITLEY, Australian Zool., vol. 8, pt. 3, p. 183, 1936 (compiled).—FOWLER, List Fish. Malaya, p. 20, 1938 (reference).

Manta ehrenbergi BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 87, 1925 (Table Bay, East London, Durban, Natal).

Brachioptilon hamiltoni NEWMAN, Zoologist, vol. 7, p. 74, 1849 (type locality: Gulf of California, west coast of Mexico).

Manta hamiltoni BEEBE, The Arcturus adventure, pp. 123, 134, 206, 304, 415, figs. 30–35, 1926 (Galapagos).—WHITLEY, Australian Zool., vol. 8, pt. 3, p. 180, 1936 (compiled).

Diabolichthys elliotti HOLMES, Proc. Elliott Soc. Nat. Hist., vol. 1, p. 39, 1856 (type locality: Charleston, S. C.).

Deratoptera alfredi KREFFT, Illustrated Sydney News, vol. 5, pp. 3, 9, woodcut fig., 1868 (type locality: Port Jackson, New South Wales).

Ceratoptera alfredi MACLEAY, Proc, Linn. Soc. New South Wales, vol. 6, p. 381, 1881 (Manly Beach).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 23, 1888 (type; Port Jackson).

Manta alfredi STEAD, Fishes of Australia, p. 233, 1908 (Port Jackson).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 13, pl. 3, fig. 43a, 1927 (photograph).—FOWLER, Proc. 4th (1929) Pac. Sci. Congr., Java, p. 508, 1930 (reference).

Daemomanta alfredi WHITLEY, Rec. Australian Mus., vol. 18, No. 6, p. 328, pl. 37, figs. 1–4, 1932 (compiled records and notes); Australian Zoologist, vol. 8, pt. 3, p. 167, pl. 12, text figs. 1–3, 1936 (Maher Island, Queensland).

Cephaloptera stelligera (Ehrenberg) GÜNTHER, Cat. Fishes British Museum, vol. 8, p. 498, 1870 (name in synonymy).—HILGENDORF, Symbol. Physic. Hemprich-Ehrenberg, pl. 2, figs. 1–9, 1899 (type locality: Red Sea).

Manta raya BAER, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 112, 1899 (type locality: Zorritos, Peru).

Mobula japonica (not Müller and Henle) JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), p. 50, 1905 (Honolulu).

Ceratoptera orissa LLOYD, Rec. Indian Mus., vol. 2, p. 176, fig. 1, pls. 5–10, figs. 1–2, 1908 (type locality: Puri).

Manta orissa WHITLEY, Australian Zool., vol. 8, pt. 3, p. 181, 1936 (compiled).

Indomanta tombazii WHITLEY, Australian Mus. Mag., vol. 6, p. 11, 1936 [on *Dicerobatis*, not Cantor, Tombazi, Journ. Bombay Nat. Hist. Soc., vol. 37, p. 227, pl., 1934 (type locality: Cape Mouze, 20 miles from Karachi, India)]; Australian Zool., vol. 8, pt. 3, p. 183, 1936 (copied).

Manta pinchoti WHITLEY, op. cit., p. 182 (type locality: Marquesas Islands) (on *Manta birostris* Fowler, 1932).

Manta fowleri WHITLEY, op. cit., p. 182 (type locality: Fanning Islands) (on *Manta birostris* Fowler, 1927).

Manta pakoka WHITLEY, op. cit., p. 183 (type locality: Uaar Hat Island, Teuaua, Ua Huka, Marquesas Islands) (on *Pakoka* Pinchot, To the South Seas, pp. 406, 408, 421, fig., 1930).

Head width 3⅔ in total length; head length to first gill opening 3⅔ in its own width. Snout very broad, as seen above with broadly concave profile; eye lateral, equally visible above and below, about 14 across interorbital; mouth width 2¾ in disk length, or 6⅗ in greatest disk width; dental plate below with 143 teeth in transverse series; interorbital widely depressed, slopes convexly down each side. First pair of gill openings 1⅕ in interspace, likewise smaller last pair.

Skin with rough asperities, each of larger with radiated bases.

Triangular dorsal fin over ventrals, with hind truncate edge ending little before hind ventral edges, fin length 5⅕ in disk length to middle of front snout edge; tail slightly longer than disk length, without spine; disk length 2²⁄₇ in disk width, widest midway in its length, outer angles narrowly triangular and curved backwards, front edges little convex and hind edges concave; ventral ends extend little beyond hind pectoral edges, obtuse.

Above blackish or dark olive, below whitish. Length, 1773 mm. (Hilgendorf.)

Red Sea, Natal, South Africa, India, Malay Peninsula, East Indies, New South Wales, Melanesia, Polynesia, Hawaii. I have long thought the Polynesian and Hawaiian specimens with 150 teeth in the dental plate were the Atlantic *Manta birostris* Walbaum. Hilgendorf's figure of a Red Sea specimen, however, shows only 143 teeth and Barnard mentions a South African specimen with 230. Garman maintains the Atlantic species with the dental plate extending over the whole width of the lower jaw bearing about 100 separated rows of teeth, at least in the young.

The following is Macleay's account of *Ceratoptera alfredi* Krefft: "This is the name affixed to a stuffed specimen of this genus of enormous size, in the Australian Museum. It was captured at Manly

Beach in 1868, and was considered by Mr. Krefft as new and undescribed species, but unfortunately he never described it, and description is now impossible, so much painting and puttying and clipping have been practised in setting up the specimen."

Subclass HOLOCEPHALI

Body massive, compressed. Tail and caudal region attenuated. Upper jaws and other palatal cartilages joined with skull. Dental plates in 3 pairs, vomerine and palatine above, mandibular below. Opercles rudimentary. One gill opening each side of pharynx, contains 4 gill clefts and 4 gills united with skin terminally. No spiracles, except in embryonic stages. Skull without system of membrane bones, as opercles, suborbitals, etc. Skeleton cartilaginous. No distinct suspensorial cartilage for lower jaw. Vertebrae imperfect, coalescent anteriorly. Brain massed posteriorly, more distributed forward, hemispheres distant from optic lobes and attached to them by nerve-like thread. Intestine with spiral valve. Skin naked, muciferous system highly developed. Dorsal fin erectile, with spine. Pectorals normal, low. Ventrals abdominal. Mature males with erectile frontal tentacle and prepelvic claspers.

The living chimaeroids are a divergent and modified branch of some primitive sharklike type. Besides certain characters of the bony fishes they have acquired others distinctively their own. Their relation to the elasmobranchs is seen in their cartilaginous skeleton, dermal denticles, the brain structure and especially the reproductive organs. The large eggs and their enclosure in horny coverings is another interesting feature in common. The single gill opening is modified toward the bony fish type, also the structure of the gill filaments, the presence of an opercle, the rectum opening externally before the urino-genital apertures and not into a cloaca.

Six families are admitted and of these three are represented by a few living forms. The fossils are, however, very numerous and date from Paleozoic time. As but few forms are known outside the Indo-Pacific I have included all the living forms, based chiefly on Garman's memoir.

ANALYSIS OF FAMILIES

a^1. CHIMAEROIDEI. Snout prominent; soft, without proboscis; claspers trifid, rarely bifid____ **Chimaeridae**

a^2. CALLORHINCHOIDEI. Snout produced, more or less as proboscis; claspers simple.

  b^1. Snout produced in long simple beak________________ **Rhinochimaeridae**

  b^2. Snout produced into leaf-shaped flexible appendage_______ **Callorhinchidae**

Order CHIMAEROIDEI

Snout prominent, soft, without proboscis. Claspers trifid, rarely bifid.

Family CHIMAERIDAE

Body elongate, rather robust anteriorly, tapering posteriorly to point at tail. Head large, compressed, without proboscis. Mouth small, inferior, upper lip deeply notched. Jaws with teeth confluent into 4 bony laminae or tritors above, 2 below, receive impact on edges. Nostrils confluent with mouth separated by narrow isthmus. Free gills 3 and one-half gill each side. Gill rakers small. Isthmus moderate. No spiracles. Notochord surrounded with narrow ring-like segments. Cerebral hemispheres fused with olfactory lobes distant from optic lobes. Skin naked, rarely somewhat prickly. Lateral line open canal, usually with numerous branches anteriorly or on head. Oviparous, egg-cases long, elliptical, with silky filaments. Mature male with erectile "frontal holders" on forehead and prepelvic tenacula. Dorsal usually divided, anteriorly short and with very strong spine, grooved behind. Second dorsal long and low. Caudal narrow, tapering, subcaudal with extended lobe. Pectorals large, free, low. Ventrals abdominal, many rayed. Mature males with trifid claspers, rarely bifid.

The living forms are remarkable for their striking appearance. Most are found in deep water or cool seas. About 17 genera described, all extinct and only *Chimaera* persisting to recent time.

Genus CHIMAERA Linnaeus

Chimaera Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 236, 1758. (Type, *Chimaera monstrosa* Linnaeus, designated by Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 54, 1883.) (Poli, 1791, in Mollusca and Ochsenheimer, 1808, in Microlepidoptera precluded.)

Chimocra Cuvier, Tabl. Element. (an. 6), p. 317, 1798. (Type, *Chimaera monstrosa* Linnaeus.)

Chimera Rafinesque, Analyse de la nature, p. 92, 1815. (Type, *Chimaera monstrosa* Linnaeus.)

Chimaira Duméril, Mem. Acad. Sci. France, vol. 27, p. 155, 1856. (Type, *Chimaera monstrosa* Linnaeus.)

Plethodus Dixon, Fossils of Sussex, p. 366, 1850. (Type, *Plethodus expansus* Dixon, monotypic.) (Fossil.)

Hydrolagus Gill, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 331. (Type, *Chimaera colliei* Lay and Bennett, monotypic.)

Dipristis Gervais, Zool. Pal. Générale, p. 240, 1869. (Type, *Dipristis chimaeroides* Gervais, monotypic.) (Fossil.)

Bathyalopex Collett, Arch. Naturv. Christiania, vol. 23, p. 5, 1901; Forh. Vid. Selskr. Christiana, No. 9, 1904, p. 5, 1905. (Type, *Chimaera* (*Bathyalopex*) *mirabilis* Collett, monotypic.)

Psychichthys Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1907, p. 419. (Type, *Hydrolagus waitei* Fowler, orthotypic.)

Phasmichthys Jordan and Hubbs, Mem. Carnegie Mus. vol. 10, p. 119, 1925. (Type, *Chimaera mitsukurii* Dean.)

Head partly conic, compressed. Snout soft and fleshy, conspicuous, large, blunt. Eye large or moderate, lateral. Mouth inferior. Tritors or dental laminae rodlike. Lips thick, lower with frenum. Gill opening small. Skin smooth. Lateral line on head with zigzag openings. First dorsal triangular. Anal present, distinct or joined with subcaudal, or rudimentary.

According to Smitt: "In the seventeenth century Kentman sent to Gesner a drawing of a fish from Denmark which he called Meeraff (*Simia marina*); and when Linnaeus found the same kind of fish from Bohuslän in the Royal Museum at Ulriksdal, he called it Monkey-fish or Monster-fish (*Chimaera*). 'Master is the name given to this fish which is so unlike all others and as it were a medley of all fishes. At certain seasons when this strange fish dieth and is cast ashore, the common people behold in him a miracle and imagine that they see laces, points, topknots, and other finery, which they believe have so displeased the great God that He hath seen good to warn them with signs and wonders, which belief news-men, no less wise than they, speed the whole world through to the edification of all'. Thus the name of *Chimaera* was introduced into ichthyology; and though the monstrosity formerly seen in the structure of the genus has disappeared in the light of modern researches into its relations to the other Elasmobranchs, the life led by these fishes is still in great part a mystery to us."

ANALYSIS OF SPECIES

a^1. Anal fin distinct from subcaudal.
  b^1. Chimaera. Caudal filament long; eyes large.
    c^1. Lateral line in short even waves on flank.
      d^1. Claspers bifid ⅔ their length.
        e^1. Tritors 5 to 7 on each vomerine ---------- **monstrosa**
        e^2. Tritors 3 on each vomerine ---------- **pseudomonstrosa**
      d^2. Claspers bifid ½ their length ---------- **phantasma**
    c^2. Lateral line irregular, not waved; claspers divided ⅓ their length.
        e^1. Iridescent dusky, blackish below ---------- **jordani**
        e^2. Mottled light, tail with light streaks ---------- **owstoni**
  b^2. Caudal filament short.
      f^1. Psychichthys. Eyes small; second dorsal not indented.
        g^1. First dorsal origin little behind gill opening.
          h^1. First dorsal 1⅘ in head; pectoral reaches beyond ventral origin ---------- **purpurescens**
          h^2. First dorsal 1⅕ in head; pectoral reaches ⅘ to ventral. **eidolon**
        g^2. First dorsal origin over gill opening.
          i^1. First dorsal 1⅔ in head ---------- **affinis**
          i^2. First dorsal little greater than head ---------- **waitei**

f^2. Hydrolagus. Eyes large; second dorsal indented; body with white spots.
  j^1. Second dorsal deeply indented; caudal filament usually short-- colliei
  j^2. Second dorsal scarcely indented; caudal filament but little less than rest of body-------------- novae zealandiae

a^2. Bathyalopex. No distinct anal fin.
  k^1. Eye large.
    l^1. Second dorsal not indented; lateral line straight, entire, irregular but not in short waves.
      m^1. Claspers trifid half their length.
        n^1. Blackish above, clouded lighter, below dark sepia; vertical fins nearly black--- mitsukurii
        n^2. Blackish, with white spots------------ barbouri
      m^2. Claspers divided half their length; dorsal spine 1⅔ head lengths; dark brown, fins purplish black. africana
    l^2. Second dorsal deeply indented; dark brown.
      o^1. Dorsal spine long as head-------------- deani
      o^2. Dorsal spine 1½ in head---------- mirabilis
  k^2. Eye moderate; lateral line with short even waves on side; brownish, with spots and narrow bands. ogilbyi

Subgenus Chimaera Linnaeus

CHIMAERA MONSTROSA Linnaeus

Chimaera monstrosa Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 236, 1758 (type locality: Atlantic Ocean); ed. 12, vol. 1, p. 401, 1766.—Bloch, Naturg. ausländ. Fische, vol. 1, p. 61, pl. 124, 1785 (North Sea).—Bonnaterre, Tableau Encyclop. Ichth., p. 13, pl. 8, fig. 25, 1788 (northern seas.)—Gmelin, Syst. Nat. Linn., vol. 1, p. 1488, 1789 (Atlantic and North Sea).—Walbaum, Artedi Pisc., vol. 3, p. 587, 1792 (on Bloch).—Lacépède, Hist. Nat. Poiss., vol. 1, p. 392, pl. 19, fig. 1, 1798 (northern sea).—Schneider, Syst. Ichth. Bloch, p. 349, 1801 (on Linnaeus).—Lay and Bennett, Zool. Beechey's Voy., Fishes, p. 72, pl. 23, fig. 3 (ventral fin and clasper), 1839.—Gray, List fish British Museum, p. 21, 1851 (no locality).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 686, pl. 13, figs. 3–4, pl. 14, fig. 1, 1865 (Cape of Good Hope).—Günther, Cat. Fishes British Mus., vol. 8, p. 349, 1870 (North Atlantic materials).—Goode and Bean, Oceanic ichthyology, p. 31 (not. fig. 31) 1895 (compiled).—Garman, Mem. Mus. Comp. Zool., vol. 40, p. 84, 1911 (North Atlantic, to 600 fathoms or more).—Roule, Res. Comp. Sci. Monaco, vol. 52, p. 126, 1919 (Azores, 1,165 meters; west of Fayal, 1,962 meters).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 94, 1925 (off Cape Point and Saldanha Bay, in 450–500 fathoms).

Chimaera argentea Ascanius, Icon., vol. 2, p. 6, 1772 (type locality: "On trouve ce poisson depuis Tronhiem jusques au Sund").

Chimaera praecisa Walbaum, Artedi Pisc., vol. 3, p. 588, 1792 (on *Callorhynchus americanus* Gronow, Act. Helvet., vol. 3, p. 49, 1772, type locality: American Ocean).

Chimaera americana Schneider, Syst. Ichth. Bloch, p. 350, 1801 (on Gronow 1772, type locality: American Ocean).

Chimaera borealis Shaw, General zoology, vol. 5, p. 365, pl. 157, 1804 (type locality: Northern Ocean).

Chimaera mediterranea RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 168, 1826 (type locality: Nice).

Chimaera cristata FABER, Nat. Fische Islands, p. 45, 1829 (type locality: Iceland).

Chimaera arctica GISTEL, Naturg. Thierreichs, vol. 8, p. 103, 1848 (type locality: Northern Seas).

Callorynchus centrina GRAY, Cat. Fish Gronow, vol. 2, p. 15, 1854 (type locality: American Ocean).

Callorynchus atlanticus GRAY, Cat. Fish Gronow, vol. 2, p. 16, 1854 (type locality: Atlantic Seas).

Chimaera vaillanti DEAN, Carnegie Inst. Washington Publ. No. 32, p. 7, 1906 (type locality: Cape of Good Hope).

Depth 7⅓ to 8½ in total length; head 6½ to 7¼. Snout 2¼ to 2¾ in head; mouth before eye; vomerine dental plates with 5 to 7 tritors; interorbital low. Gill rakers 12 short points.

Lateral line irregular though without distinct even waves.

First dorsal inserted over hind gill opening edge, spine 1⅓ to 1⅖ in head, front and hind edges finely serrated and fin joined with second dorsal by low fold; second dorsal 2⅗ to 2⅔ in total, uniformly low; anal slightly less than eye, in male little before supracaudal and in female encroaches below front of supracaudal; in male subcaudal little longer than supracaudal, in female subequal; caudal filament 3½ to 4 in rest of body; pectoral 5 to 5⅕ in total, reaches ventral bases, width 2 in its length; ventral 1¼ to 1½ in head, triangularly pointed.

Back reddish brown, lighter or darker. Sides mostly silvery, shading to blue above, below white. Under silvery luster of sides dorsal color spreads in curious figures, oblong spots, arranged in longitudinal rows, sinuous, indefinite patches kind of marbled pattern thus formed. Silvery lateral line marked by brown edges. Iris golden or silvery, pupil greenish. Vertical fins like back, caudal with black margin more or less forward along second dorsal and upper hind edge of first dorsal. Paired fins like back, anterior or under surface lighter with rays of ashy gray. Inside mouth and pharynx more or less black, tongue and branchial arches yellowish. Said to reach 1,200 mm. (Smitt.)

South Africa. Also North and middle Atlantic and Mediterranean.

2 examples. A.N.S.P. Italy. C. L. Bonaparte. No. 252. Articulated skeletons.

CHIMAERA PSEUDOMONSTROSA Fang and Wang

Chimaera pseudomonstrosa FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 280, fig. 28, 1932 (type locality: Tsingtau).

Depth subequal with head length; head 5 or less to subcaudal origin, width 2 in its length. Snout 2⅙ in head; eye 4½, 2 in snout, greater than interorbital; mouth small, inferior, with thick lips;

teeth 2 above, 2 below, edges of each tooth strongly concave, more or less ridges at inner surface, and lower teeth much longer than upper; 3 elongate tritors on each of vomerine dental laminae, 1 anterior, 2 posterior and large one at inner basal wall of each lower tooth; nostrils large, close together, confluent with mouth corners.

Lateral line wavy from anterior to second dorsal origin, less so hindward, nearly straight behind middle of second dorsal; an upward curve below dorsal spine and a gentle downward curve above origin, running posteriorly along base of subcaudal.

First dorsal spine 1⅒ in head, strong erectile spine keeled in front and grooved, serrated at hind edge of terminal portion and followed by low dermal fold; fin triangular, short, deep, arises directly behind head; low second dorsal uniformly high, begins just behind tip of depressed dorsal spine, 3 times long as head, not indented on upper edge, reaches supracaudal origin; anal small, rises slowly, separated from subcaudal by narrow notch; caudal fin low, rises slowly in front gradually descends behind; pectoral 1¼ times head, width 1¾ in length, extends beyond ventral base; ventral inserted little behind second dorsal origin, premedian in fish.

Color in formalin pale, somewhat dusky on dorsal side. Body with dark, longitudinal broken streaks, darker along lateral line. Fins grayish silvery.

Length, 980 mm. (Fang and Wang.)

China. Said to be very closely related to *Chimaera monstrosa* of the Atlantic, differing in having 3 tritors on each vomerine instead of 5 to 7, and one more on inner wall of each tooth of lower jaw.

CHIMAERA PHANTASMA Jordan and Snyder

Chimaera phantasma Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (type locality: Tokyo); Annot. Zool. Japon., vol. 3, p. 43, 1901 (Nagasaki; Goto Is.; Yeso; Yokohama).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 670, 1903 (type).—Dean, Journ. Coll. Sci. Tokyo, vol. 19, art. 3, p. 3, pl. 1, figs. 3–4, 1904 (Misaki).—Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 27, p. 223, fig. 1, 1904 (type).—Garman, Mem. Mus. Comp. Zool., vol. 40, p. 87, 1911 (Sagami Bay).—H. M. Smith, Proc. U. S. Nat. Mus., vol. 42, p. 231, 1912 (Verde Island Passage; northern Mindanao).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 185, 1920 (Tokyo market).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 116, 1925 (Osaka market; Sagami Bay).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Mokpo, Korea).—Lin, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 173, figs. 15–15a, 1932 (Tsingtao).—Tanaka, Jap. Fish. Life Colours, No. 37, 1933.—Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 17, 1937 (reference).

Chimaera monstrosa (not Linnaeus) Schlegel, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 300, pl. 132, 1850 (Iles Goto).—Bleeker Verh. Batav. Genootsch. (Japan), vol. 25, p. 21, 1853 (Goto, Japan).—Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 16, 1931 (Misaki; Nagasaki; compared with North Sea and Palermo materials).

Chimaera purpurascens (Gilbert) JORDAN and SNYDER, Smithsonian Misc. Coll., vol. 45, p. 235, 1904 (name and reference only).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, No. 3, p. 86, 1911 (part).

Depth 2 to 2⅖ to vent; head 1⅞ to 2⅛, width 1¾ ? to 2. Snout 2⅞ to 3 in head; eye 2⅘ to 3, subequal with snout, much greater than interorbital; mouth very slightly before front eye edge; upper dental plates with parallel vertical ridges; interorbital 5 to 6, convex. Gill opening low, apparently not extending upward beyond pectoral origin.

Skin smooth. Lateral line very finely and rather evenly waved in its course over paired fins, less so posteriorly.

Dorsal spine 1⅛ in head, with few low antrorse serrae along each hind edge terminally, 2⅔ to 3¼ in length of soft dorsal; caudal filament 1¼ in rest of body; anal small, low, distinct from caudal; pectoral large, reaches about opposite middle of depressed ventral, longer than head or 1⅗ in head and body to vent; ventral 3.

Brown generally, paler to grayish below. Fins all more or less dusky to blackish brown. Under surface of head and belly whitish. Iris grayish.

Japan, Korea. The following, all very poorly preserved, the muscles soft and easily falling apart, therefore the above description imperfect. All seem to belong to the present species, which not previously reported from the Philippines.

According to Dean the females reach 1,000 mm. or more, the males 850 mm. They are usually sluggish in their movements when kept in shallow water. They swim about slowly, but oftener remain in the same position, merely balancing, moving their pectorals up and down, in slow rhythm. In confinement, as when in shallow water in large floating fish baskets, they rarely live longer than the second day. At their accustomed depth, judging from their behavior when freshly caught, Dean was convinced they are normally far stronger and more alert than he had been led to believe.

6680. D. 5297. Matocot Point, S. 50° E., 5.10 miles (lat. 13°41′20″ N., long. 120°58′ E.). China Sea, vicinity southern Luzon. July 24, 1908. Length 292 mm.

6672. D. 5296. Matocot Point, S. 63° E., 4.50 miles (lat. 13°40′09″ N., long. 120°57′45″ E.). July 24, 1908. Length, 330 mm. to end of broken caudal.

10027. D. 5298. Matocot Point, S. 38° E., 6.70 miles (lat. 13°43′25″ N., long. 120°57′40″ E.). July 24, 1908. Length, 203 mm.

3100. D. 5516. Point Tagolo Light, Mindanao, S. 80° W., 9.7 miles (lat. 8°46′ N., long. 123°32′30″ E.). August 9, 1909. Length, 331 mm.

D. 5550. Jolo Light, Jolo, N. 83° E. 15.5 miles (lat. 6°02′00″ N., long. 120°44′40″ E.). September 17, 1909. Larva, 75 mm. long, tail long and filamentous.

CHIMAERA JORDANI Tanaka

Chimaera jordani Tanaka, Journ. College Sci. Tokyo, vol. 20, art. 2, p. 2, pl. 1, fig. 1, 1905 (type locality: Off Idzu, Sagami Sea); Fishes of Japan, vol. 1, pl. 10, fig. 30, 1911 (type).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Manazuru).

Chimaera purpurascens (not Jordan and Snyder) Garman, Mem. Mus. Comp. Zool., vol. 40, p. 86, 1911 (part).

Depth $6\frac{5}{6}$ in total; head $6\frac{9}{10}$. Snout $2\frac{1}{6}$ in head, obtusely convex; eye $3\frac{3}{4}$, $1\frac{2}{3}$ in snout; mouth close before eye; teeth confluent, 5 or 6 rods in each lamina above, margin sinuate and slightly convex; mandibular plates included within upper; interorbital $4\frac{1}{2}$ to 5 in head, rather low.

Lateral line straight along side of body, almost without any sinuation.

First dorsal inserted over gill opening, spine $6\frac{4}{5}$ in total length, with median keel and smooth anteriorly, grooved behind with terminal third with recurved spinules, fin continuous with second dorsal by low fold; second dorsal length $2\frac{1}{4}$ in total length uniformly high; anal with hind notch separating subcaudal little behind upper notch, length $3\frac{1}{2}$ in second dorsal length; upper caudal lobe little shorter though similar to subcaudal; pectoral $4\frac{3}{4}$ in total, reaches little beyond ventral origin, width $2\frac{4}{7}$ its length; ventral $1\frac{2}{5}$ in head; clasper of male trifid, divided to $\frac{2}{3}$ its length.

Uniformly dark brown. Length, 900 mm. (Tanaka.)

Japan.

CHIMAERA OWSTONI Tanaka

Chimaera owstoni Tanaka, Journ. Coll. Sci. Tokyo, vol. 20, art. 2, p. 10, pl. 1, figs. 2–3, 1905 (type locality: Sagami Bay); Fishes of Japan, vol. 1, p. 18, pl. 5, figs. 17–18, 1911 (types).—Garman, Mem. Mus. Comp. Zool., vol. 40, p. 86, 1911 (compiled).

Depth $6\frac{1}{10}$ in total; head $6\frac{1}{3}$. Snout 2 in head, obtusely convex; eye $3\frac{4}{5}$, $1\frac{4}{5}$ in snout; mouth before eye; 6 rods in front plate of upper jaw, edge of plate sinuate and slightly convex; each lower lamina with 2 concavities more or less sinuate in margin; interorbital $4\frac{1}{7}$ in head.

Lateral line finely sinuate on body anteriorly, more pronounced behind ventrals.

Dorsal spine equals head, front surface smooth with median keel, hind edge with recurved spinules little less half its length, inserted $\frac{2}{5}$ eye diameter behind gill opening and joined with second dorsal by low fold; second dorsal $2\frac{1}{4}$ in total, uniformly high; anal separated from subcaudal by notch opposite hind edge of second dorsal, fin length about $3\frac{1}{4}$ in second dorsal; subcaudal little longer and deeper than supracaudal, though little lower than second dorsal; pectoral

4⅒ in total, reaches ventral, width 2⅗ its length; ventral 1¼ in head; male with clasper trifid, divided to terminal third.

Dark brown, with lighter dotlike and elongate spots, often indistinctly vermiculate by spots fusing. This marking extends on head and bases of paired fins. On side behind ventrals 3 pale broad lines below lateral line and 1 above. Dorsals, anal, caudal and free margins of paired fins blackish; basal parts of dorsals similar on side of body; numerous transverse series of dark dots above lateral canal on side of body. Length, 935 mm. (Tanaka.)

Japan.

Subgenus Psychichthys Fowler

CHIMAERA PURPURESCENS Gilbert

Chimaera purpurescens Gilbert, Bull. U. S. Fish Comm., vol. 23, pt. 2 (1903), p. 582, fig. 231, 1905 (type locality: Kaui, Hawaiian Islands). (*Chimaera purpurascens* Jordan and Snyder 1904, not involved.)

Chimaera gilberti Garman, Mem. Mus. Comp. Zool., vol. 40, p. 90, 1911 (on Gilbert).—Fowler, Mem. Bishop Mus., vol. 10, p. 26, 1928 (compiled).

Depth 5, body greatly compressed and very deep; head 4⅕, width 2, sides flattened. Snout 2⅕ in head, elevated, deep, well compressed, formed as flexible flap, width at front of eyes half its length; eye 5, front edge little before middle in head length, 2⅕ in snout, greater than interorbital; mouth width 3⅓ in head, jaws massive, very broad lips finely papillose; upper dental plate with 7 rods each side median line; lower jaw with 2 very widely spaced dental points; interorbital 6, convexly elevated, constricted.

Skin largely smooth, though lower side of pharynx fully wrinkled, area extending forward to mandible.

Dorsal spine smooth and compressed, 1⅔ in head, but trifle shorter than fin; second dorsal occupies greater upper portion of tail; upper caudal lobe length 2⅖ in base of second dorsal; pectoral much longer than head or 3¾ in entire body length, greatest width ½ length; ventral 1⅔ in head.

Dark drab brown, shaded darker below. Iris pale grayish. Fins all slaty.

Hawaii.

U.S.N.M. No. 51594. Kauai, Hawaiian Islands. Bureau of Fisheries. Length, 845 mm. Type.

CHIMAERA EIDOLON (Jordan and Hubbs)

Psychichthys eidolon Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 117, pl. 5, fig. 1, 1925 (type locality: off Mishima, Izu, in Sagami Bay, Japan).

Chimaera purpurascens (not Gilbert, 1903 [1905]) Jordan and Snyder. Smithsonian Misc. Coll., vol. 45, p. 235, 1904 (off Mishima, Izu in Sagami Bay).—Tanaka, Journ. Coll. Sci. Tokyo, vol. 20, p. 14, 1905.

Depth 6¼ in total; head 6½, width 2. Snout 1⅞ in head, obtusely convex; eye 4⅕, 2¼ in snout; mouth before eye; front lower dental plates with 5 to 7 enamel rods, front plates of lower jaw notched at symphysis; interorbital little narrower than eye, convex.

Lateral line very slightly undulous, though not evenly waved.

First dorsal inserted nearly eye diameter behind head, spine 1¼ in head, slender, entire, continuous with second dorsal by low fold; second dorsal length 2⅛ in total length, uniformly high; upper and lower caudals alike, latter longer or begins well before hind end of second dorsal; pectoral 5 in total, 1⅕ to ventral, width 1⅘ its length; ventral 1⅖ in head.

Uniform deep purplish black, as dark on belly as on back. Length, 1,285 mm. (Jordan and Hubbs).

Japan. Said to differ from *Chimaera purpurescens* in the much higher first dorsal and shorter pectoral.

CHIMAERA AFFINIS Capello

Chimaera affinis CAPELLO, Jorn. Sci. Mat. Phys. Nat. Lisboa, vol. 1, p. 314, pl. 3, figs. 1, 1868 (type locality: Setubal, Portugal).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 350, 1870 (copied).—GOODE and BEAN, Oceanic ichthyology, pp. 31, 509, pl. 10, figs. 32–35, 1895 (off Georges Banks).—JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, 95, 1896 (compiled).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 91, 1911 (North Atlantic from 300–900 fathoms).

Chimaera plumbea GILL, Bull. Philos. Soc. Washington, vol. 2, p. 182, 1877. (type locality: "Southeast of La Have bank, in lat. 42°40′ N., long. 63°23′ W., at a depth of 350 fathoms").

Chimaera abbreviata GILL, Proc. U. S. Nat. Mus., vol. 6, p. 254, 1883 (type locality: Lat. 40°16′15″ N., long. 66°58′ W., in 1,290 fathoms).

Depth 5⅞ in length to end of upper caudal lobe; head 5⅕. Snout 2 in head, acutely produced; eye about 7, 3½ in snout; cephalic appendage with 5 spines on inner surface; mouth below front of eye; interorbital moderately high.

Lateral line with few feeble undulations anteriorly, jugular branch meets postorbital near junction of latter and suborbital and angular branches.

First dorsal 1⅔ in head, spine with front edge rounded, fin continuous with second dorsal by low fold; second dorsal little more than half total length to hind end of upper caudal lobe, uniformly low and without emargination, its upper edge straight; upper caudal and subcaudal similarly high as second dorsal, origin of latter about opposite last fifth of second dorsal; pectoral 4¼ in length to hind edge of upper caudal lobe, not quite reaching ventral origin, width half its length; ventral 1⅗ in head; clasper of male trifid at terminal third its length.

Uniformly plumbeous. Length, 1,246 mm. (Goode and Bean.)

North Atlantic, in 300–963 fathoms.

CHIMAERA WAITEI (Fowler)

Hydrolagus waitei Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 419, fig. 1 (type locality: Victoria, Australia).

Chimaera waitei Garman, Mem. Mus. Comp. Zool., vol. 40, p. 91, 1911 (compiled).

Depth 5⅔ in total; head about 5, width 2⅙. Snout 1⅘ in head, obtusely convex; eye 6¼, 3 in snout; mouth before eye, width 3 in head; above 2 small flat triangular mouth plates and below 2 trenchant strong plates; interorbital 3¾ in head.

Lateral line straight along side of body axially; jugular section meets postorbital near junction of latter with angular and suborbital branches.

Dorsal spine slightly larger than head, front edge sharply trenchant, hind edges with about 30 serrae, apparently not connected with second dorsal; second dorsal uniformly low, length about 2⅔ in total length; supracaudal little higher than anal and about as long; no anal; pectoral reaches middle of ventral base, 5⅘ in total length, width 1⅘ its length; ventral 2⅛, obtuse.

Uniform dull brownish.

Victoria. Apparently only known from the above described example, now dried and in poor condition.

A.N.S.P. No. 33119. Victoria, Australia. Mrs. Agnes F. Kenyon. Length, 305 mm. Type.

Subgenus HYDROLAGUS Gill

CHIMAERA COLLIEI Lay and Bennett

Chimaera colliei Lay and Bennett, Zool. Beechey's Voy., Fishes, p. 71, pl. 23, figs. 1–2, 1839 (type locality: Monterey, Calif.).—Girard, Rep. Pacific R. R. Surv., Fish, pt. 10, p. 360, 1858 (Puget Sound; Washington).—Duméril, Hist. Nat. Elasmobr., vol. 1, p. 689, 1865 (compiled).—Günther, Cat. Fishes British Mus., vol. 8, p. 350, 1870 (Esquimault Harbor; Monterey).—Garman, Mem. Mus. Comp. Zool., vol. 40, p. 92, 1911 (California and northward).

Chimaera colliaei Jordan and Jouy, Proc. U. S. Nat. Mus., vol. 4, p. 16, 1881 (Monterey, California).—Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 55, 1883 (compiled).

Chimaera collei Dean, Carnegie Inst. Washington, Publ. No. 32, p. 7, pls. 8–11, 1906 (Monterey, Calif.).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 28, 1930 (Far East Seas).

Hydrolagus collici Gill, Proc. Acad. Nat. Sci. Philadelphia, p. 331, 1862 (reference).—Cope, Proc. Amer. Philos. Soc., vol. 13, p. 24, 1873 (Alaska).—Jordan and Evermann, U. S. Nat. Mus. Bull. 47, pt. 1, p. 95, 1896 (Monterey to Alaska).—Evermann and Goldsborough, Bull. Bur. Fisher., vol. 26 (1906) p. 230, fig. 4, 1907 (Alaska).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 603 (Monterey, Alaska).

Hydrolagus colliei Goode and Bean, Oceanic ichthyol., p. 32, 1895 (compiled).

Callorhynchus antarcticus (not Linnaeus) Goode and Bean, Oceanic Ichthyol., pl. 10, fig. 36, 1895 (from Lay and Bennett).

? *Chimaera media* Garman, Mem. Mus. Comp. Zool., vol. 40, p. 91, 1911 (locality uncertain).

Depth 5⅞ to 6⅖ in total length; head 4⅘ to 6⅓. Snout 2 in head, obtusely convex; eye 3 to 3⅔, 1⅘ to 2 in snout; mouth before eye; vomerine teeth with 5 to 7 rods; interorbital 3⅘ in head, rather low.

Lateral line straight on body, jugular section meets postorbital near junction with suborbital and angular.

Dorsal spine 1 to 1¼ in head, interdorsal equals first dorsal base and continuous by low fold; second dorsal length 2⅔ to 2⅞ in total length, upper edge medially emarginate nearly ¾ anterior height and posterior height little lower; upper and lower caudals lower than second dorsal, lower begins only very slightly before end of second dorsal, fin ending in slender attenuated point but usually not a filament; pectoral nearly 4 in total, width 3 in length; ventral 6, rounded; male with claspers short, not reaching ventral ends, bifid about half their length, trifid cartilages with 2 or 3 confluent by skin terminally.

Brown or gray-brown, shading whitish below. Back and sides with many variable irregular whitish spots.

North east Pacific from California to Alaska.

Garman describes *Chimaera media* on a male and female without locality, differing chiefly from the present species in the second dorsal fin divided. His specimens are 510 and 560 mm. long. Possibly they are only variants of *Chimaera colliei.*

1 example. A. N. S. P. Alaska. George Davidson.
1 example. A. N. S. P. California ? W. N. Lockington.
4 examples. A. N. S. P. Pacific Grove, Calif. Harold Heath.

CHIMAERA NOVAE ZEALANDIAE Fowler

Chimaera novae zealandiae FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 603 (on Hector).—GRIFFIN, Trans. New Zealand Inst., vol. 54, p. 246, pl. 20, fig. 2, 1923 (9 miles north of Kaipara Heads).

Chimaera monstrosa var. *australis* (not Shaw) HECTOR, Trans. New Zealand Inst., vol. 34, p. 239, pl. 14, fig. C, 1902 (type locality: New Zealand).

Chimaera australis WAITE, Rec. Canterbury Mus., vol. 1, No. 1, p. 9, 1907 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 88, 1911 (compiled).

Depth 8½ in total; head 7¼, upper profile of male convex before eye. Snout 1⅞ in head, obtusely conic; eye 3¼, 1¾ in snout; mouth before eye; tritors on dental plates rodlike; interorbital 1¼ wide as eye. Convex. Lower gill rakers 9.

Lateral line first concave, then convex above pectoral, then along side slightly above middle by series of very short waves until below hind edge of second dorsal, when bending to lower edge of caudal axis; jugular branch meets orbital near junction of latter with angular and suborbital.

Dorsal spine 1½ in head, keeled on front edge and serrated behind; first dorsal ray 1⅖, connected with second dorsal by low fold; second dorsal length 3⅗ in total length, upper edge slightly concave medially with front portion of fin slightly higher than posterior;

supracaudal very slightly shorter than subcaudal, equally high and subcaudal begins near last sixth of second dorsal, without distinct anal; caudal moderate filament; pectoral reaches hind ventral angle, about 6⅘ in total, width 1⅖ its length; ventral 1½ in head, obtuse; front ventral claspers retractile into shallow crescentic glandular pouches; large posterior claspers bifid, 3 times anterior claspers and about equal ventral fin, inner split along about half its length and both claspers almost wholly with short spines directed backwards.

Ground color cream, marbled with purplish brown. Double line of bluish white spots above eye from nape to base of snout. Light buff blotches and spots, various, at short intervals along margin of back. Lateral line dull white. Eye silver-white and blue-black. Horny cap on top of head cream color, streaked with brown. First dorsal spine white, base streaked with brown, rays and membranes blackish brown with broad mesial white band. Second dorsal with small dark patch on front rays, thence broadly margined black, bases of rays much lighter. Caudal rays uniform blackish brown, filament white. Paired fins brownish gray. Length, 773 mm., filament 210 mm. (Griffin.)

New Zealand.

Subgenus BATHYALOPEX Collett

CHIMAERA MITSUKURII Dean

Chimaera mitsukurii DEAN, Journ. Coll. Sci. Tokyo, vol. 19, art. 3, p. 6, pl. 1, figs. 1–2, 1904 (type locality: Misaki, Sagami).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 27, p. 234, fig. 2, 1904 (Sagami Bay).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 87, 1911 (Sagami Bay).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Misaki).

Phasmichthys mitsukurii JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 119, 1925 (Misaki).

Chimaera phantasma (not Jordan and Snyder) JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 669, 1903 (Sagami Bay).

Depth 9⅗ in total length; head 8⅓. Snout 2⅕ in head, obtusely convex; eye 3¼, 1⅖ in snout; mouth below front of eye; upper front dental plate with about 8 tritors, hind plate with 3 well-marked on inner face and most lateral narrowest; lower dental plate with a single tritor projecting sharply from its inner surface, narrow; interorbital low.

Lateral line somewhat irregular, not waved; jugular section meets angular short space below junction of orbital and angular.

Dorsal spine long as head, inserted over hind edge of gill opening, front and hind edges serrated, connected with second dorsal by low fold; second dorsal length 2⅘ in total, upper edge slightly concave little before middle; subcaudal little deeper than supracaudal, apparently twice as long as supracaudal with its origin opposite middle of second dorsal, anal not distinct; caudal filament slightly over twice in rest of body; pectoral 6⅛, reaches middle of ventral base, width 1¾ its length; ventral 1¼ in head, rather obtusely pointed.

Blackish above, with here and there clouded light areas, below dark sepia. Vertical fins nearly black, somewhat paler basally. Bluish tint on front rim of ventral. Length, 600 mm. (Dean.)

Japan.

CHIMAERA BARBOURI Garman

Chimaera barbouri Garman, Bull. Mus. Comp. Zool., vol. 51, No. 9, p. 255, 1908 (type locality: Aomori, Japan).—Tanaka, Fishes of Japan, vol. 1, p. 16, pl. 4, fig. 14, pl. 5, fig. 19, 1911.—Garman, Mem. Mus. Comp. Zool., vol. 40, p. 88, 1911 (Aomori; off Otsu).—Tanaka, Jap. Fish. Life Colours, No. 38, 1933.

Bathyalopex barbouri Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 118, 1925 (reference).

Chimaera spilota Tanaka, Journ. College Sci. Tokyo, vol. 23, p. 15, 1908 (type locality: Off Miyako, Rikuchu; Ishinomaki, Rikuzen).

Head little over 5 in length to end of second dorsal, 2½. Eye 3½ in head.

Lateral line irregular, not in short waves; jugular branch meets postorbital near junction of latter with suborbital and angular.

Dorsal spine 1½ in head; dorsals united by low fold, interdorsal shorter than base of first dorsal; second dorsal 2½ times head length, depth equals orbital length and depth in mid-length half as much, border rising posteriorly to nearly anterior height; upper caudal slightly deeper than longer subcaudal, caudal a filament; pectorals large, reach ventrals, hind edges slightly concave; male with short, stout claspers trifid, more than half their length, each of 3 branches somewhat similarly expanded terminally.

Blackish, with white spots on flanks. (Garman.)

CHIMAERA AFRICANA Gilchrist

Chimaera africana Gilchrist, Marine Biolog. Surv. South Africa, Spec. Rep. No. 2, p. 51, pl. 8, 1922 (type locality: Natal coast in 324 fathoms).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 95, 1925 (copied).—Norman, *Discovery* Rep., vol. 12, p. 47, 1935 (South Africa).

Depth 10⅔ in total; head 8¾. Snout 2¼ in head, ends in rather robust convexity; eye 3, 1¼ in snout; mouth before front of eye; upper dental plate sharp, 5 columns on each side of jaw, with projecting irregular margin; lower dental plate similar, wider, on each side of more numerous teeth, ill defined forms continuous cutting edge deeply incised; interorbital rather low.

Lateral line straight. Cephalic appendage with 6 short spines.

First dorsal spine 6¾ in total length, variable, anteriorly with thin ridge bluntly serrated from base to ¾ its length, on hind side of groove bordered each side by sharp ridge or keel with low retrorse spines from point where joining soft rays to tip; second dorsal continuous with first by low membrane, separated from caudal by notch, second dorsal length 3⅛ in total length, uniformly high; upper caudal and subcaudal similar, both little lower than second dorsal, origin of subcaudal about last fifth of second dorsal; pectoral 5¼ in total, reaches ventral, width 2⅖ its length; ventral 8⅞, front and hind claspers well developed, each of latter ending in rounded knob with small terminal papillae, divisions of hind claspers ⅓ their length.

Body dark brown, fins purplish black. Length not given. (Gilchrist.)

Natal coast.

CHIMAERA DEANI H. M. Smith and Radcliffe

Chimaera deani (H. M. Smith and Radcliffe) H. M. Smith, Proc. U. S. Nat. Mus., vol. 42, p. 232, pl. 29, 1912 (type locality: lat. 13°45′15″ N., long. 120°46′30″ E., off Sombrero Island, west coast of Luzon, in 236 fathoms).

Chimaera daeni Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 17, 1937 (reference).

Depth 5⅓ to supracaudal origin; head 4½. Snout 2⅓ in head, obtuse, profiles alike; eye 2⅓, elevated, subequal with snout; mouth opposite front eye edge, hind angle of jaws opposite hind pupil edge, or its length 3⅕ in head; interorbital moderate, forms slight convexity in upper profile of head above front of eye.

Lateral line axial and continuous, deflected little behind supracaudal origin; with continuous forward loop around eye on side of head.

Dorsal spine inserted close behind gill opening, long as head, feebly and sparsely serrated on upper or terminal half, fin height 3⅘ in fish to supracaudal origin; interdorsal notch very narrow; second dorsal height anteriorly 3⅒ in head, twice its height posteriorly; supracaudal height 8 in head; caudal filament elongated, slender, little longer than space between snout tip and supracaudal origin; no anal; pectoral 2⅚, width 2 in its length, hind edge convex; ventral 1⅒ in head, hind edge little concave.

Uniform blackish brown.

Philippines.

This species differs from *Chimaera mirabilis* in the smaller eye, higher first dorsal with longer and more slender spine, more elevated second dorsal, less extensive subcaudal, longer pectoral, and different coloration.

U. S. N. M. No. 72284. Lat. 13°45′15″ N., long. 120°46′30″ E., off Sombrero Island, west coast of Luzon, in 236 fathoms. *Albatross* Expedition. Length, 19.5 cm. from snout tip to supracaudal origin, 23.5 cm. from supracaudal origin to end of caudal filament. Type.

CHIMAERA MIRABILIS Collett

Chimaera (*Bathyalopex*) *mirabilis* COLLETT, Forh. Vid. Selskr. Christiania, No. 9, p. 5, 1904 (type locality: Faroe Bank in 750–1,200 meters); Rep. Norwegian Fish. Marine Investigation, vol. 2, p. 35, pl. 1, fig. 4, 1905 (Faroe Channel; Faroe Bank).

Chimaera mirabilis GARMAN, Mem. Mus. Comp. Zool., vol. 40, No. 3, p. 89, 1911 (Faroe Channel, 750–1,200 meters).

Depth 9⅞ in total length; head 8⅞. Snout 2 in head, obtusely convex; eye 2, equals snout; interorbital low, forehead obtusely convex over front of eye.

Lateral line bends in short upper loop close behind junction with ocular and orbital branches; jugular branch meets angular below eye and short space below junction of angular with orbital and suborbital branches; on body lateral line straight.

Dorsal spine long as dorsal base or 1½ in head, reaches second dorsal origin and continuous with second dorsal by low fold; second dorsal length 3⅗ in total length, little higher anteriorly than posteriorly and depressed medially; supracaudal 1⅘ subcaudal length, which begins little before last third in second dorsal base and without anal division; caudal ends in long filament about eye diameter longer than rest of body; pectoral 6⅖ in total, reaches little beyond ventral base, width 1½ its length; ventral 1⅖ in head, convex behind.

Gray brown, fins darker. Length, 450 mm. (Collett.)

Faroe Bank.

CHIMAERA OGILBYI Waite

Chimaera oglibyi WAITE, Prelim. Rep. *Thetis*, p. 41, pl. 11, 1898 (type locality: New South Wales); Mem. Australian Mus., vol. 4, p. 48, pl. 6, 1899 (off Port Hacking, New South Wales).—TANAKA, Journ. College Sci. Tokyo, vol. 23, art. 7, p. 10, 1908 (Suruga Bay; Kagoshima).—STEAD, Fishes of Australia, p. 233, 1908.—MCCULLOCH, Zool. Res. *Endeavour*, vol. 1, p. 5, 1911 (Bass Strait).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, No. 3, p. 90, 1911 (compiled).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 13, pl. 2, fig. 44a, 1927.

Depth 6¾ in total length; head 5¼. Snout 1⅔ in head, obtusely conic; eye 5, 3⅛ in snout; mouth before eye; front upper dental plates with sinuous margin and each formed of 6 to 8 enamel rods, palatine pair with outer edges roughly denticular and flat surfaces each with 3 tubercles white and enamel-like; lower dental plates with margin incised by 3 deep clefts, 1 median and 2 lateral, forming 4 rounded prominences and long white enamel elevation backward from behind each of outer or posterior cusps; interorbital low.

Lateral line with even short waves over greater portion anteriorly on body; jugular section meets orbital section close to junction of orbital with angular and suborbital sections.

Dorsal spine 1¼ in head, front and hind edges terminally serrated; first dorsal ray 1⅙ (fin apparently separate from second dorsal); second dorsal uniformly low, length 2⅖ in total length; supracaudal little shorter than subcaudal which begins slightly before supracaudal but without notch to indicate anal; pectoral reaches middle of ventral, 4⅛ in total length, width 2 in its length; ventral 1⅔ in head, pointed.

Silvery above and on sides, yellowish below. Snout tip black. Eye yellow. Lateral line raised, brown. Markings formed as narrow bands passing obliquely from behind forward and downward, confined to head and front part of body and formed of brown splashes which below become rings, also extend across chin and pectoral bases. Above lateral line whole body marked with 25 narrow transverse broken lines, oblique on tail. Fin membranes bluish black, bases of paired fins horn color. Caudal filament yellow. Length, 860 mm. (caudal filament incomplete). (Waite.)

Bass Strait, New South Wales.

CHIMAERA TSENGI Fang and Wang

Chimaera tsengi FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 281, fig. 29, 1932 (type locality: Chefoo; Chinhai; Chekiang).

Depth 1⅕ in head length; head greater than 5 in length to supracaudal origin, width 2 in its length. Snout 2⅓ in head, soft and triangular in anterior profile, without rostral appendage; eye 4⅓, 1¾ in snout, greater than interorbital; mouth small, inferior; teeth 2 in each jaw, upper with 10 laminae forming serrated cutting edge, anterior one pointed, posterior very short, broad and its hind edge more or less roughened; laminae of lower jaw 8 each side, forming broadly concave cutting edge; vomerine tritors 1 anterior and 2 posterior on each side which much elongated, 1 tritor in inner wall of lower teeth; nostrils large, close together, short space before mouth. Gill opening small, before pectoral base.

Lateral line wavy anteriorly, less so below front part of second dorsal and straight posteriorly; an upward curve below supracaudal origin and posteriorly along subcaudal base.

First dorsal spine 1¼ in head, compressed, pointed, straight, front edge smooth and keeled, hind edge serrated, especially its tip and with shallow groove, when depressed nearly reaches second dorsal origin; second dorsal very long, uniform, joined to first dorsal by very low rayless fold of skin and separated from supracaudal by deep notch. Anal confluent with subcaudal. Caudal with very short filament; supracaudal much lower than second dorsal and shorter than subcaudal. Pectoral 1¼ times head, width 1¼ times its length, with thick muscular base, when depressed reaches far posterior to ventral base.

Color in formalin light brown above, paler below. Back with broad and longitudinal dark streak along base of dorsals to caudal, 2 shorter and more obscure streaks, 1 above lateral line and 1 below, on anterior part of body. Lateral line dusky. Top of head darker, lighter band across snout in front of eye. Fins blackish toward tips.

Length, 750 mm. (Fang and Wang.)

China. Differs from *Chimaera monstrosa* and allied species chiefly in the confluent anal and subcaudal fins.

Order CALLORHINCHOIDEI

Snout produced, more or less as proboscis. Claspers simple.

Family RHINOCHIMAERIDAE

Body elongate, tapering into very long tail, tip filamentous. Head with long rostral proboscis, pointed, with cartilaginous midrib and foliaceous lateral skin expansions at base. Gill openings separated by wide isthmus. Notochord with rings. Cerebral hemispheres distant from both olfactory and optic lobes. Lateral canal system subtubular. Dorsals 2, first with great, erectile, triangular spine, lateral edges serrate, close to head; second dorsal low. Anal not distinct from subcaudal. Caudal tapers backward to filament. Subcaudal well developed, without produced lobe. Pectorals large, free. Males with small, simple claspers, slender, end in volute knob with hooked spines. Males with frontal holder or tenaculum and prepelvic tenacula.

Bathypelagic.

ANALYSIS OF GENERA

a^1. Snout compressed; upper caudal edge spinose____________ **Rhinochimaera**
a^2. Snout depressed; upper caudal edge not spinose________________ **Harriotta**

Genus RHINOCHIMAERA Garman

Rhinochimaera GARMAN, Proc. New England Zool. Club, vol. 2, p. 76, 1901. (Type, *Harriotta pacifica* Mitsukuri.)

Snout depressed, elongated into slender point, profile of forehead nearly straight. Teeth without tritors or dental plates, much like horny covers of jaws of tortoises or birds. Supracaudal low, upper edge armed with spines. Male with peduncle of frontal tenaculum short and straight, owing to straight upper profile of head.

RHINOCHIMAERA PACIFICA (Mitsukuri)

Harriotta pacifica MITSUKURI, Zool. Mag., Tokyo, vol. 7, p. 97, pl. 16, 1895 (type locality: Kurihama, near Misaki, Sagami Sea).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 43, 1901 (Sagami Bay?).—DEAN, Jour. Coll. Sci. Tokyo, vol. 19, art. 4, pls. 1–2, 1904.

Rhinochimaera pacifica Garman, Proc. New England Zool. Club, vol. 2, p. 75, 1901 (reference); Bull. Mus. Comp. Zool., vol. 41, p. 247, pls. 1–2, figs. 1–2, pl. 3, figs. 1, 4–5, pl. 4, figs. 2–4, pl. 5, figs. 1–2, pls. 8–9, pl. 12, pls. 14–15 (anatomy), 1904; Mem. Mus. Comp. Zool., vol. 40, p. 94, 1911 (Japan).—H. M. Smith, Proc. U. S. Nat. Mus., vol. 42, p. 232, 1912 (egg-capsule from lat. 3°17′40″ S., long. 120°36′45″ E).

Rhinochimaera (Harriotta) pacifica Dean, Journ. Coll. Sci. Tokyo, vol. 19, art. 4, p. 1, 1904 (Misaki).

Depth 9⅓ in total; head 3⅔, width 4. Snout 1¼ in head; eye 10⅓, 8 in snout, subequal with interorbital, 2¾ to end of front of upper jaw; jaws fall little before last fourth in snout length; interorbital convexly elevated.

Dermal denticles of male on frontal and 2 ventral pairs of claspers; in female only on dorsal rim of supracaudal. Lateral line nearly straight along side.

First dorsal begins eye diameter behind gill opening, spine $3\frac{1}{10}$ in total head length, hind lateral edges for terminal third with minute irregular denticles, fin continuous with second dorsal by low fold; second dorsal low, gradually little higher behind middle, length $4\frac{1}{10}$ in total; supracaudal low fold, little distinct, subcaudal deep as second dorsal also as long; tail ends in slender filamentous point; pectoral 6 in total, reaches about ⅞ to ventral, width 3⅓ its length; ventral 2⅔, pointed; long slender claspers little shorter than ventral line, ends small and globular.

Plumbeous, paler below. Muzzle white, which color extends forward along sides and ventral margin of greatly produced snout. Dorsals margined with dusky band and paired fins darkest along front margins. Mature females over 1,300 mm., males 900 mm. (Dean.)

Japan.

Genus HARRIOTTA Goode and Bean

Harriotta Goode and Bean, Proc. U. S. Nat. Mus., vol. 17, p. 471, 1895. (Type, *Harriotta raleighana* Goode and Bean, monotypic.)—(Goode and Bean) Goode, Proc. Biol. Soc. Washington, vol. 3, p. 104, 1886 (generic name only).

Anteliochimaera Tanaka, Journ. College Sci. Tokyo, vol. 27, p. 27, 1909. (Type, *Anteliochimaera chaetirhamphus* Tanaka, monotypic.)

Snout elongate, depressed, somewhat flattened, forehead curving down before snout. Teeth with tritors, notches, or sinuations on cutting edges. Supracaudal moderately high, upper edge without spines. Frontal tenaculum of male with elongate, much-curved stem to comport with downward curve of forehead.

HARRIOTTA RALEIGHANA Goode and Bean

Harriotta raleighana Goode and Bean, Proc. U. S. Nat. Mus., vol. 17, p. 472, pl. 19, 1895 (type locality: Gulf Stream in lat. 36°–39° N., long. 70°–74° W., in 707–1,081 fathoms); Oceanic ichthyology, p. 33, pl. 11, figs. 37–40, 1895 (Gulf Stream).—Jordan and Evermann, U. S. Nat. Mus. Bull. 47, pt. 1,

p. 96, 1896 (compiled); pt. 4, pl. 19, fig. 4, 1900 (copied).—GARMAN, Bull. Mus. Comp. Zool., vol. 41, p. 263, pl. 2, figs. 3–5 (head), pl. 4, fig. 1 (skin), pl. 5, figs. 3–9 (dentition), 1904 (types).—DEAN, Carnegie Inst. Washington Publ., No. 32, p. 6, 1906 (reference).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 37, p. 662, pl. 38, 1910 (North Atlantic).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 95, 1911 (Western Atlantic, in 707–1,080 fathoms).

Rhinochimaera atlantica HOLT and BYRNE, Ann. Mag. Nat. Hist., ser. 8, vol. 3, p. 279, 1909 (type locality: Lat. 50°31′ N., long. 11°31′ W., 670–770 fathoms, Irish Atlantic slope).

Harriotta atlantica GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 96, 1911 (copied).

Anteliochimaera chaetirhamphus TANAKA, Journ. College Sci. Tokyo, vol. 27, p. 7, pl. 1, 1909 (type locality: Sagami Sea); Fishes of Japan, vol. 1, p. 10, pl. 3, fig. 11, pl. 4, figs. 15–16, 1911.

Harriotta chaetirhamphus BEAN and WEED, Proc. U. S. Nat. Mus., vol. 37, p. 662, pl. 39, 1910 (North Pacific, Japan).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, No. 3, p. 95, 1911 (Okinose, Sagami Sea, in 400 fathoms).

Depth 4⅔ to 7⅞ in total; head 4 to 4½, width 1⁹⁄₁₀ to 2⅕. Snout 1⅓ to 1½ in head; eye 6¼ to 9¼, 4⅗ to 6⅕ in snout, 2⅓ to 3 in interorbital; preoral length 1½ in head; mouth rather close before eye; interorbital 2⅘, convex.

Lateral line nearly straight along side of body axially; jugular section meets orbital behind junction of orbital with suborbital and angular branches.

Dorsal spine 1⅔ to 2⅗ in head, hind edges finely serrated, interdorsal space nearly equals eye; second dorsal uniformly low, about 5 in total length; supracaudal shorter than subcaudal, which longer than supracaudal in young; no anal; tail ends in rather short filament with age, less than subcaudal length; pectoral 3¾ in total in young to 6½ with age, reaches ventral in adult though much shorter with young, width half its length; ventral 1⅗ to 2¾ in head, pointed.

Uniform brown, caudal filament paler.

Japan. Also in the Atlantic.

HARRIOTTA PINNATA Schnakenbeck

Harriotta pinnata SCHNAKENBECK, Mitt. Zool. Mus. Hamburg, vol. 44, p. 40, figs. 6–9, 1931 (type locality: Walvis Bay, Southwest Africa).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 2, p. 1158, fig. 488, 1936 (copied).—BARNARD, Ann. South African Mus., vol. 32, pt. 2, p. 46, 1937 (reference).

If really different from *Harriotta raleighana* this species seems to be distinguished chiefly by the presence of a small well-marked anal lobe below the hind end of the low dorsal. Described from a male 100 cm. and a female 108 cm. long.

Family CALLORHINCHIDAE

Body compressed, tapers backward and becomes slender in tail. Head short, pointed. Snout with flexible proboscis ending in retrose leaflike terminal end. Teeth with tritors receiving impact on sides instead of edges. Tritors of palatines in mandibulars on sides of laminae. Notochord without rings. Cerebral hemispheres nearer optic lobes than to olfactories, connections slender. Lateral line tubular. First dorsal advances near occiput, short, with strong erectile spine; second dorsal short; anal farther back than dorsal, distinct from subcaudal. Caudal axis slightly elevated from body. Pectorals large, free, male with simple, slender claspers, appear as if rolled into tube joined near end. Male with frontal tenaculum and 2 prepelvic tenacula.

Genus CALLORHINCHUS Lacépède

Callorynchus Gronow, Zoophylacii, p. 31, 1763 (species nonbinomial). (Type, *Chimaera callorynchus* Linnaeus, monotypic; Cuvier, Règne animal, vol. 2, ed. 1, p. 140, 1817.)

Callorhinchus Lacépède, Hist. Nat. Poiss., vol. 1, p. 400, 1798. (Type, *Chimaera callorynchus* Linnaeus.)

Callorhincus Duméril, Zool. Analytique, p. (104) 333, 1806. (Type, *Chimaera callorynchus* Linnaeus.)

Callorhyncus Fleming, Philos. Zool., vol. 2, p. 380, 1822. (Type, *Chimaera callorynchus* Linnaeus.)

Callorhynchus Cuvier, Règne animal, vol. 2, ed. 2, p. 382, 1829. (Type, *Chimaera callorynchus* Linnaeus.)

Callorinchus Griffith and Smith, Animal Kingd. Cuvier, Griffith's, vol. 10, p. 97, 1834. (Type, *Chimaera callorynchus* Linnaeus.)

Callirhynchus Agassiz, Nomencl. Zool. Index, pp. 56, 60, 1846. (Type, *Chimaera callorynchus* Linnaeus.)

Body and head somewhat deeper than wide. Vomerine teeth without rods. Mandibular and palatine dental plates with 1 or 2 tritors each; in some young tritors longitudinal parallel bars on side of lamina, sometimes persistent. Frontal tenaculum of male with wide stem and broad articulation. Caudal with more or less produced subcaudal lobe. Caudal filament moderate to short or absent.

ANALYSIS OF SPECIES

a^1. Pectorals reach ventrals.
  b^1. Dorsal origin forward of ends of pectoral bases; pectorals nearly reach mid-bases of ventrals; tritors with long, slender, pointed prongs, subequal. **capensis**
  b^2. Dorsal origin little behind pectoral origin; pectorals reach beyond mid-bases of ventrals; tritors with thick, unequal prongs, outer shorter. **callorynchus**
  b^3. Dorsal origin somewhat before pectoral bases; pectorals nearly or quite reach ventral bases; tritors with short, thick prongs, outer very short. **milii**
a^2. Pectorals not reaching ventrals; tritors 2 on each palatine tooth, not fused with age, strong, longitudinally parallel bars__________________ **smythii**

CALLORHINCHUS CAPENSIS Duméril

Callorynchus capensis Duméril, Hist. Nat. Elasmobr., vol. 1, p. 695, pl. 13, figs. 5–5a, 1865 (type locality: Cape of Good Hope).—Garman, Mem. Mus. Comp. Zool., vol. 40, p. 99, 1911 (Cape of Good Hope).—Fowler, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 2, p. 1159, fig. 489, 1936 (compiled).

Callorhynchus capensis Günther, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (Cape of Good Hope).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 96, 1925 (west coast from Walfish Bay south to Agulhas Bay, to 50 fathoms).

Callorhynchus antarcticus (not Lay and Bennett) Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 21, p. (50, 57) 78, 1860 (Cape of Good Hope).—Duméril, Hist. Nat. Poiss., Elasmobr., vol. 1, p. 693, pl. 13 (head), 1865 (Cape of Good Hope).—Günther, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (Cape of Good Hope).—Regan, Ann. Natal Gov. Mus., vol. 1, p. 242, 1908 (Bird Island).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, p. 290, 1917 (references).

Depth 5½ to subcaudal origin; head 3½. Snout 1⅔ in head; eye 5⅔, 3⅗ in snout; palatine plate with 2 narrow longitudinal tritors, mandibular plate with slightly broader median tritor which anteriorly acute; interorbital low.

Lateral line rather uniformly irregular, waves moderate and similar.

Dorsal spine inserted nearly eye diameter before pectoral origin, 1⅖ in head, front and hind edges serrated; second dorsal inserted above hind part of ventral base, front fin edge 2¼ in head, or 2¼ in its base; anal begins before hind dorsal end, length 2⅒ in head; caudal 2⅘ in rest of body, front subcaudal edge 4 in head; ventral 2; pectoral reaches about ¼ in ventral, 2¾ in length to subcaudal origin, width 3¼ its length.

Silvery, back and fins dark brown. Dorsal spine, dental plates and hooks on tenacula greenish. Pupil emerald green, iris like body. Female to 960 mm., male 740 mm. (Barnard.)

South Africa, to 50 fathoms.

CALLORHINCHUS CALLORYNCHUS (Linnaeus)

Chimaera callorynchus Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 236, 1758 (type locality: "In Mari Aethiopico"); ed. 12, vol. 1, p. 402, 1766 (copied).—Bonnaterre, Tableau encyclop. Ichth., p. 14, 1788 (Chile).—Walbaum, Artedi Pisc., vol. 3, p. 589, 1792 (copied).

Chimaera callorhynchus Gmelin, Syst. Nat. Linn., vol. 1, p. 1489, 1789 (Aethiopian Sea; Chile; not New Holland).—Schneider, Syst. Ichth. Bloch, p. 350, 1801 (Mari Aethiopico; Chile).

Chimaera callorhinchus Lacépède, Hist. Nat. Poiss., vol. 1, p. 401, pl. 12, fig. 2, 1798 (Chile; not New Holland).

Callorynchus callorynchus Mensch, Mus. Gronow, p. 19, 1778 (reference).—Garman, Mem. Mus. Comp. Zool., vol. 40, p. 98, 1911 (off southern South America).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1926, p. 277 (Chile).

Callorhynchus callorhynchus Berg, Ann. Mus. Buenos Aires, vol. 4, p. 18, 1895 (Santa Cruz, Mar del Plata, Montevideo, Rio de la Plata).—Evermann and Kendall, Proc. U. S. Nat. Mus., vol. 31, p. 73, 1906 (Argentina).—Evermann and Radcliffe, U. S. Nat. Mus. Bull. 95, p. 18, 1917 (La Ventanilla, Peru).—Norman, *Discovery* Rep., vol. 16, p. 35, figs. 12, 13, 1937.

Chimaera australis Shaw, General zoology, vol. 5, p. 368, pls. 157 (upper fig.) and 158, 1804 (type locality: southern seas).

Callorynchus elephantinus Bory, Dict. Class. Hist. Nat., vol. 3, p. 61, 1823 (type locality: Chile).

Callorhynchus elephantinus Gistel, Naturg. Thierreichs, p. 103, 1848 (Chile).

Callorhynchus antarcticus Lay and Bennett, Zool. Beechey's Voy., Fishes, p. 75, 1839 (no type locality).—Günther, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (Chiloe); Proc. Zool. Soc. London, 1881, p. 19.—Smitt, Bihang Svenska Vet. Akad. Handl., vol. 24, p. 66, pl. 6, fig. 43a, 1899 (Bay of Puerto Madryn, Tierra del Fuego).—Garman, Bull. Mus. Comp. Zool., vol. 41, pl. 7, figs. 7–9, pl. 10, 1904.

Callorynchus peronii Duméril, Hist. Nat. Elasmobr., vol. 1, p. 694, pl. 14, figs. 4–4a (spines), 1865 (type locality: "Péron de son voyage aux terres australes; Valparaiso").

Callorynchus argenteus Phillipi, Anal. Mus. Nac. Chile, sec. 1, p. 11, pl. 5, fig. 1, 1892 (type locality: Chile).

Depth 5 to subcaudal origin; head 3. Snout 1½ in head, frontal flap as seen above elongately triangular, with broad short stem; eye 6¾, about 4⅖ in snout; (each palatine plate of adult with single tritor, fused portion massive and broadly rounded, prongs in front rather short and thick, especially outer one—Garman); interorbital low.

Lateral lines irregularly sinuous, not evenly waved; small asperities in rows in interorbital on cheek and along back before and behind second dorsal.

Dorsal spine 1¼ in head, origin about opposite pectoral origin, front edge with fine serrae medially and hind edge with larger antrorse serrae terminally; front edge of second dorsal 2¼ in head, 1½ in its base, origin behind ventral origin; anal begins behind end of second dorsal, length 2 in head; caudal nearly 2 in rest of body, front subcaudal edge 3 in head; ventral 1⅞; pectoral 2¾ to subcaudal origin, reaches middle of depressed ventral, width 2¼ its length.

Silvery with blotches of dull bluish over the back. Borders and ends of fins blackish. Male 337 mm., female 343 mm. (Smitt.)

Off Chile and Argentina.

CALLORHINCHUS MILII Bory

Callorynchus milii Bory, Dict. Class. Hist. Nat., vol. 3, p. 62, pl. 5, 1823 (type locality: Western coasts of New Holland).—Garman, Mem. Mus. Comp. Zool., vol. 40, p. 100, 1911 (Australia, Tasmania, New Zealand).

Callorhynchus milii Garman, Bull. Mus. Comp. Zool., vol. 41, p. 267 (Hobarttown), pl. 6, figs. 7–8 (teeth), pl. 15, figs. 4–5 (brain), 1904.—Waite, Rec. South Australian Mus., vol. 2, p. 35, fig. 49, 1921.

Callorhynchus millii McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (Günther's Port Denison record said incorrect).

Callorhynchus tasmanius RICHARDSON, Proc. Zool. Soc. London, vol. 7, p. 29, 1840 (type locality: Murderers Bay, Tasmania, Jan. 16, 1770, Solander); Trans. Zool. Soc. London, vol. 3, p. 174, 1841 (Tasmania).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 696, 1865.

Callorynchus australis (not Shaw 1804) HOBSON, Tasmania Journ. Sci. Agr. Stat., vol. 1, p. 14, 1842.

Callorhynchus antarctica (not Lay and Bennett) GRAY, List Fish British Museum, vol. 1, p. 22, 1851 (Australia).—HECTOR, Trans. New Zealand Inst., Wellington, vol. 34, p. 239, pl. 14, figs. A–B, 1902.

Callorhynchus antarcticus GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (Australia; Kangaroo Island; Port Denison; New Zealand).—HECTOR, Colonial Mus. Gov. Surv. Dept. (Fishes New Zealand), p. 74, 1872.—CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 214, 1872 (Cape of Good Hope, Victoria, Portland, Tasmania).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 285, 1880 (Australia; Tasmania); vol. 6, p. 349, 1881 (coasts of Australia and Tasmania).—McCOY, Prodromus Zool. Victoria, dec. 12, pl. 112, 1886.—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 24, 1888 (Bass Straits; Tasmania; Hobart).

Callirhynchus dasycaudatus COLENSO, Trans. New Zealand Inst., vol. 11, p. 298, pl. 17, fig. 1, 1879 (type locality: Poverty Bay).

Callorhynchus callorhynchus (not Linnaeus) WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 23, pl. 16, fig. 2, 1909 (east coast South Island to Cook Strait, in 9–102 fathoms).—McCULLOCH, Zool. Res. *Endeavour*, vol. 1, p. 16, 1911 (Bass Straits and Victorian coast).

Depth 3⅕ to vent; head 2, width 3. Snout 1⅗ in head, lower flap of rostrum 1⅘ its length; eye 5½ in head, 3⅘ in snout, 1⅓ in interorbital; mouth width 6 in head; edges of teeth in both jaws straight and nearly even; interorbital 4½, broadly convex. Gill opening 5¾.

Skin smooth. Lateral line continuous to end of caudal; extends forward and parallel with hind and lower eye edges, giving branch toward pectoral and 3 anterior radiating on cheek; upper branch connects its fellow at supraoccipital and sends branch forward to end of snout.

Dorsal spine 1⅓ in head, 1¼ in pectoral length, which 2 in combined head and trunk length to vent; ventral length 4.

Silvery gray, little darker on head above and on back. Iris grayish. Fins all more or less brownish, first dorsal soft portion more deep or dark gray brown terminally.

Tasmania, Victoria, New Zealand.

U.S.N.M. No. 39697. New Zealand. Otago University. Length, 270 mm.

CALLORHINCHUS SMYTHII Lay and Bennett

Callorynchus smythii LAY and BENNETT, Zool. Beechey's Voy., Fishes, p. 75, pl. 22, fig. 3, 1839 (type locality: Pacific Ocean, La Concepcion, South America).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 697, 1865 (copied).

Callorhynchus smythii GARMAN, Bull. Mus. Comp. Zool., vol. 41, p. 271, pl. 6, figs. 1–4, 1904; Mem. Mus. Comp. Zool., vol. 40, p. 98, 1911 (Chile; Peru).

Callorynchus callorynchus (not Linnaeus) CUVIER, Règne animal, vol. 2, p. 140, 1817.

Callorhynchus antarcticus (not Linnaeus) GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (part).—VAILLANT, Mission Sci. Cap Horn, Poiss., p. 16, 1888 (Estuaire de Santa Cruz de Patagonie).—GARMAN, Bull. Mus. Comp. Zool., vol. 17, p. 74, pls. 3–4, 1888 (lateral canal system).—PHILIPPI, Anal. Mus. Nac. Chile, sec. 1, pl. 4, 1892.

Callorynchus tritoris GARMAN, Bull. Mus. Comp. Zool., vol. 41, p. 271, pl. 6, fig. 9, 1904 [type locality: Mexillones, Peru (on nearly complete skeleton)]; Mem. Mus. Comp. Zool., vol. 40, p. 101, 1911 (copied).

Depth 4½ to subcaudal origin; head 3½. Snout 1½ in head; eye 5, 3⅕ in snout; tritors of dental plates commonly elongate bars, as in young, not swollen and fused posteriorly, thus 2 tritors on each palatine plate; interorbital low.

Lateral line with short waves between ventrals and anal, below second dorsal, otherwise rather straight.

Dorsal spine inserted nearly over gill opening, nearly long as head, hind edge barbed terminally; second dorsal origin opposite ventral origin, front fin edge 2½ in head or 1½ in fin base; anal begins opposite end of second dorsal, length 3⅔ in head; caudal 2⅕ in rest of body, front subcaudal edge 3½ in head; pectoral reaches ⅘ to ventral, length 2⅚ to subcaudal origin, width 2⅓ its length; ventral 2⅖ in head.

With age more or less uniform silvery, varying pale or dark. Young with black spots on dorsal bases, on second dorsal tip, row of 4 or 5 along lateral line from second dorsal forward, sometimes large spot below eye and another above pectoral, also 1 on ventrals and one on subcaudal. (Lay and Bennett; Garman.)

Chile, Peru. Known chiefly by its short pectorals.

Subclass TELEOSTOMI

Jaws and fins normally fishlike. Membrane head bones, as opercle, preopercle etc., developed. Skeleton sometimes cartilaginous, usually bony. Skull with sutures. Bones supporting fin rays called actinosts or pterygials, greatly modified, though concealed by body integument. Usually 2 bones connect pectoral fin with shoulder girdle. Hypercoracoid flat, square, usually perforated by foramen. Variation in coracoids, sometimes imperfect or specially modified. Lungs imperfectly developed, or degraded to form swim-vessel, or entirely absent. Heart developed, divided into an auricle, ventricle and arterial bulb. Gills with outer edges free, their bases attached to bony arches, normally four pairs and fifth pair typically modified into tooth-bearing lower pharyngeals. Ova small. Median and paired fins usually developed, latter with distinct rays. No claspers.

Among these, the true fishes, a number of the more generalized orders group themselves into several series, of which the ganoids may be considered first.

Series GANOIDEI

Skeleton usually cartilaginous, sometimes very primitive. Air bladder highly developed, usually cellular and functional as a lung. but connects with upper side of gullet, not with ventral side as in dipnoans. Optic nerves crossing before reaching eyes, thus form more or less perfect chiasma. Arterial bulb of heart with many valves. Intestine with spiral valve. Usually an armature of bony plates present, diamond-shaped and with an enamel like that formed on teeth. Tail usually distinctly heterocercal, if only obviously so. Pectoral fin with numerous basal bones or actinosts.

The ganoid fishes form a purely provisional assemblage, showing many archaic features and therefore are grouped together nearest the crossopterygians or fringe fin stock of fishes. The great range of variation in structure and form likely indicate the remnants of a vast host of primitive fishes derived from some of the fringe fins. In Mesozoic seas ganoids were hardly less varied and perhaps scarcely less numerous than the teleosts living in the seas today. In number and variety of forms they greatly exceed the fringe fins. Of the six orders usually admitted, four are still represented by a few living forms.

Order CHONDROSTEI

Teeth small or absent. Subopercle and preopercle absent. Branchiostegals few or absent. Cartilaginous vertebrae imperfectly developed. Notochord persistent. Axinosts and baseosts of median fins arranged in simple regular series, rays more numerous than supporting elements. Pelvic fins with well-developed baseosts. Shoulder girdle with pair of infraclavicular plates. Optic nerves forming chiasma. Intestine with spiral valve. Body naked or with longitudinal rows of bony plates. Rhombic plates on tail. One dorsal and one anal, distinct from caudal. Caudal usually heterocercal. Pair of pectorals and pair of ventrals.

A large group comprising nearly half of the extinct ganoid fishes besides the few living sturgeons, now thought degenerate modern forms. Families, three.

Family ACIPENSERIDAE

Body elongate, partly cylindrical. Head large, robust. Snout depressed, extended, conic or partly spatulate, with sensory areolae on lower surface. Eyes small. Mouth small, inferior, protractile. Lips thick, produced into marginal lobes. No teeth, except microscopic ones in larval stages. Maxillary distinct from premaxillary. Four barbels in transverse row on snout below before mouth. Nostrils large, double, olfactory membrane with smooth central disk surrounded by rosette of folds. Gills 4, also accessory opercular gill. Branchial arches 5. Pseudobranchiae imperfect. Gill membranes joined to isthmus. No branchiostegals. Air bladder large, joined to esophagus with short pneumatic duct, sides spacious. Pancreas divided into mushroomlike pyloric appendages. Spiral valve in rectum. Five longitudinal rows of bony plates or bucklers, each with median keel ending in spine, sometimes obsolete with age. Plates as median dorsal, lateral and abdominal row each side, last sometimes deciduous. Skin between large plates rough with small irregular plates. Head covered with bony plates joined with sutures. Fin rays slender, articulated. Vertical fins with fulcra. Dorsal fin posterior. Anal similar and somewhat behind. Tail heterocercal, lower lobe developed and upper covered with rhomboid scales. Pectorals moderate, low. Ventrals many rayed, small, behind middle of body.

Large sluggish fishes, living in the seas and fresh waters of northern countries. Their food is small or minute plant and animal life sucked in through the tubelike mouth. Great variation individually and with age has led to the description of many nominal forms. Genera, four or five among living forms.

Genus ACIPENSER Linnaeus

Acipenser LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 237, 1758. (Type, *Acipenser sturio* Linnaeus, designated by Jordan and Copeland, Bull. Buffalo Soc. Nat. Hist., vol. 3, p. 161, 1876.)

Accipenser GOUAN, Hist. Pisc., pp. 12, 13, 1770. (Type, *Acipenser sturio* Linnaeus.)

Ichthyocolla GEOFFROY, Descr. 719 plantes, p. 399, 1767. (Type, *Acipenser huso* Linnaeus.)

Sterleta GÜLDENSTÄDT, Nov. Com. Sci. Petropol., vol. 16, p. 533, 1772. (Species nonbinomial. Type, *Acipenser ruthenus* Linnaeus.)

Sturio RAFINESQUE, Indice Itt. sicil., p. 41, 1810. (Type, *Acipenser sturio* Linnaeus, monotypic.)

Dinoctus RAFINESQUE, Amer. Monthly Mag. Crit. Rev., vol. 3, p. 447, Oct. 1818. (Type, *Dinoctus truncatus* Rafinesque, monotypic. No description.)

Sterletus RAFINESQUE, Ichth. Ohiensis, p. 80, 1820. (Type, *Accipenser serotinus* Rafinesque=*Acipenser rubicundus* Lesueur, designated by Jordan and Gilbert, Proc. Acad. Nat. Sci. Philadelphia, 1877, p. 87.)

Sterleda BONAPARTE, Cat. Metod. Pesci Europei, p. 21, 1846. (Type, *Acipenser ruthenus* Linnaeus.)

Dinectus RAFINESQUE, Ichth. Ohiensis, p. 82, 1820. (Type, *Dinectus truncatus* Rafinesque=*Acipenser rubicundus* Lesueur, monotypic.)

Ellops MINDING, Lehrb. Naturg. Fische, p. 124, 1832. (Type, *Acipenser helops* Pallas.)

Huso BRANDT and RATZEBURG, Med. Zool., vol. 2, p. 4, 1833. (Type, *Acipenser huso* Linnaeus, tautotypic.)

Helops (not Fabricius, 1775, in Coleoptera) MÜLLER, Abh. Akad. Wiss. Berlin, 1834, p. 73. (Type, *Acipenser stellatus* Pallas.)

Antaceus **Heckel** and **Fitzinger**, Ann. Wiener Mus., vol. 1, pp. 269, 293, 1836. (Type, *Acipenser schypa* Güldenstädt).

Lioniscus **Heckel** and **Fitzinger**, op. cit., p. 370. (Type, *Acipenser glaber* Fitzinger.)

Schipa **Brandt**, Bull. Acad. Sci. Petersburg, vol. 7, p. 113, 1850. (Type, *Acipenser schypa* Güldenstädt.)

Sinosturio **Jaekel**, Mon. Geol. Palaeont., vol. 3, text-fig. 25, 1929. (Type, *Acipenser dabryanus* Duméril.)

Snout mostly depressed below level of forehead, partly conic. Lower lip developed only at mouth corners. Gills rather small, narrow, slender. Pseudobranchiae small. Small spiracle above eye. Caudal peduncle deeper than wide, rather short, incompletely armored and rows of bony plates distinct to base of caudal fin. Tail not produced as filament, its tip surrounded by caudal rays.

Over 20 species known. Other more northern species in the Pacific are as follows:

ACIPENSER DAURICUS Georgi

Acipenser dauricus **Georgi**, Reise im Russ. Reich., vol. 1, p. 352, 1775 (type locality: Amur; Argun; Schilka; Onon).—**Heckel** and **Fitzinger**, Ann. Wiener Mus., vol. 1, p. 318, 1836 (copied).

Acipenser (*Sterletus*) *dauricus* **Duméril**, His. Nat. Poiss., Ganoides, vol. 2, p. 259, 1870 (part).

Huso dauricus **Bonaparte**, Cat. Metod. Pesci Europei, p. 22, 1846 (reference).—**Berg**, Zapiski Acad. Sci. St. Petersbourg, vol. 24, p. 16, 1909 (Nikolajewsk, Onon R. 30 km. from Tschindinty, mouth of Amur R., Cape Naleo, Ussuri); Faune Russie Poiss., vol. 1, p. 146, pl. 4, 1911 (same material).—**Soldatov** and **Lindberg**, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 30, figs. 5–6, 1930 (Far East seas).—**Taranetz**, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 53, fig. 30, 1937 (head below).

Acipenser orientalis **Pallas**, Zoogr. Rosso-Asiat., vol. 3, p. 107, 1811 (on Georgi and Steller).—**Maack**, Travels in Amur, p. 28, 1859 (Schilka at Nertschinsk, Onon); Travels in Ussuri, p. 201, 1861 (Ussuri, Sungatschin, Lake Hanka).

Huso orientalis **Dybowski**, Verh. zool.-bot. Gesell. Wien, vol. 22, p. 218, 1872 (Amur, Argun, Onon, Ussuri, Sungatschi, Lake Hanka); Rep. St. Petersbourg. Dep. Imp. Russ. Geogr. Soc., vol. 8, p. 23, 1877 (Amur, Argun, Onon).

Acipenser kaluschka (Steller) **Heckel** and **Fitzinger**, Ann. Wiener Mus., vol. 1, p. 318, 1836 (name in synonymy).

Acipenser mantschuricus **Basilewsky**, Nouv. Mem. Soc. Imp. Nat. Moscou, vol. 10, p. 250, 1855 (type locality: Amur).

ACIPENSER SCHRENCKI Brandt

Acipenser schrencki **Brandt**, Mélang. Biol. Soc. Acad. Sci. St. Petersbourg, vol. 7, p. 115, 1869 (type locality: Amur River and larger tributaries).—**Berg**, Zapiski Acad. Sci. St. Petersbourg, vol. 24, p. 20, 1909 (Nikolajewsk, Ussuri, Amur River mouth near Cape Maleo, 2 km. below Chor River mouth); Faune Russie, Poiss., vol. 1, p. 274, pl. 8, fig. 2, 1911 (above localities).—**Soldatov** and **Lindberg**, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 31, figs. 7–8, 1930 (Far East seas).—**Taranetz**, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 53 (reference), 1937.

Sturio schrencki Dybowski, Verh. zool.-bot. Gesell. Wien, vol. 22, p. 219, 1872 (Amur, Ussuri, Sungatschin, Hanka, Argun, Onon); Rep. St. Petersbourg Dep. Imp. Russ. Georgr. Soc., vol. 8, p. 24, 1877 (above localities).

Acipenser sturio (not Linnaeus) Georgi, Reise im Russ. Reich., vol. 1, p. 352, 1775 (Schilka).—Pallas, Zoogr. Rosso-Asiat., vol. 3, p. 91, 1811 (Eastern seas).—Maack, Travels in Ussuri, p. 200, 1861 (Amur, Ussuri, Sungatschin, Lake Hanka).

ANALYSIS OF SPECIES

a^1. Snout obtuse or short, at least 1 or 2 times in postocular.
  b^1. Dorsal rays III or IV, 31 to 36.
    c^1. Lateral plates 41 to 43; dorsal plates 15 or 16; ventral plates 12 to 16. **multiscutatus**
    c^2. Lateral plates 34; dorsal plates 7 or 8; ventral plates 9-----**acutirostris**
  b^2. Dorsal rays III, 63; lateral plates 32; ventral plates 11-------- **kikuchii**
a^2. Snout elongate, attenuate, slender, at least longer than postocular.
    d^1. Lateral plates 33; no asperities between preopercle and opercle. **dabryanus**
    d^2. Lateral plates 40 or 41; row of vertical asperities between preopercle and opercle-- **chinensis**

ACIPENSER MULTISCUTATUS Tanaka

Acipenser multiscutatus Tanaka, Journ. College Sci. Tokyo, vol. 23, art. 7, p. 21, pl. 2, fig. 1, 1908 (type locality: 7 miles off Ikedohama, Iwaki, Tokyo).

Depth $6\frac{2}{3}$ to subcaudal origin; head $4\frac{4}{5}$, width $1\frac{3}{4}$. Snout $2\frac{2}{5}$ in head, short, rather obtuse; eye $17\frac{7}{9}$; preoral length $1\frac{7}{8}$; interorbital $11\frac{1}{6}$, longitudinally concave.

Dorsal plates 15 or 16, each with median longitudinal ridge, without distinct spine, large, rugose, close behind small plate from fourth to seventh; lateral plates 41 to 43, similar to dorsal, anterior 2 each with small plate in front and all well separated though without posterior small plate; ventral plates 12 to 16. Behind dorsal fin 4 or 5 rugose plates, 3 behind, 2 before anal; skin between rows of plates soft and smooth; large scapular plate with small one posterior; cheek with fine stellate prickles; skin with rather sparse, small, stellate prickles.

Dorsal begins behind ends of ventrals, front edge $1\frac{1}{2}$ in head, rays VII, 35; anal begins behind middle of dorsal base, rays VII, 28; caudal $3\frac{3}{5}$ in rest of body, subcaudal $1\frac{1}{2}$ in caudal or equals head; pectoral $1\frac{1}{2}$; ventral about 2.

Color ? Length, 2,120 mm. (Tanaka.)

Northern Japan.

ACIPENSER ACUTIROSTRIS Ayres

Acipenser acutirostris Ayres, Proc. California Acad. Sci., vol. 1, p. 14, 1854 (type locality: San Francisco).—Günther, Cat. Fishes British Mus., vol. 8, p. 344, 1870 (from Ayres).

Acipenser medirostris AYRES, Proc. California Acad. Sci., vol. 1, p. 15, 1854 (type locality: San Francisco).—KIRSCH and FORDICE, Proc. Acad. Nat. Sci. Philadelphia, 1889, p. 249, 1890 (San Francisco).—JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, p. 104, 1896 (compiled).—BERG, Faune Russie, Poiss., vol. 1, p. 287, pl. 8, fig. 3, 1911 (Hakodate and Aniwa Bay at Korsakowsk, Saghalin I.).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 32, figs. 9–10, 1930 (Far East seas).—TARANETZ, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 53, 1937 (reference).

Acipenser (Antaceus) medirostris DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 3, p. 167, pl. 13, fig. 2, 1867 (San Francisco); Hist. Nat. Poiss., Ganoides, vol. 2, p. 222, 1870.

Acipenser (Antaceus) agassizi DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 3, p. 181, pl. 11, fig. 2, 1867 (type locality: San Francisco); Hist. Nat. Poiss., Ganoides, vol. 2, p. 237, 1870 (type).

Acipenser (Antaceus) alexandri DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 3, p. 183, pl. 15, fig. 1a–b, 1867 (type locality: San Francisco); Hist. Nat. Poiss., Ganoides, vol. 2, p. 239, pl. 15, fig. 1, 1870 (type).

Acipenser (Antaceus) oligopeltis DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 3, p. 184, pl. 15, fig. 2, 1867 (type locality: San Francisco); Hist. Nat. Poiss., Ganoides, vol. 2, p. 241, 1870 (type).

Acipenser mikadoi HILGENDORF, Sitz. Ber. Naturf. Freunde Berlin, p. 98, 1892 (type locality: Tokyo market, doubtless from Hokkaido).—JORDAN and SNYDER, Journ. College Sci. Tokyo, vol. 15, p. 303, 1901 (Ishikari River, Teshio, Mikawa).—SCHMIDT, Pisces marinum orientalium, p. 284, 1904 (Hakodate).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 30, p. 398, 1906 (Ishigari River, Teshio and Mikawa streams, Hokkaido).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 185, 1920 (Ishikarigawa).

Depth 6½ to 7; head 3¾ to 3⅘. Snout 2 to 2$\frac{1}{10}$ in head, short, rather sharp.

Dorsal plates 7 or 8; laterals 34; ventrals 9. Plates well keeled, with radiating striae, rather rugose; 4 to 6 plates behind dorsal; 2 to 4 plates behind anal; sides above, between series of large plates, with smaller mostly stellate plates, 14 forming irregular row behind dorsal series. Top of head long; cheeks with rough plates; opercle rugose.

D. IV, 31 to 36, fin height 3⅓ in head; A. III, 25 to 28; caudal 1⅕ in head.

Length, 1,200 mm. (Jordan and Snyder.)

Northern Japan. Also in the northeastern Pacific in California. Hilgendorf says it reaches 1,525 mm. He gives snout 2½ in head, moderately pointed; barbel nearer eye than snout tip; 10 dorsal plates, 30 or 31 laterals; D. 39 to 43. Length, 967 mm.

ACIPENSER KIKUCHII Jordan and Snyder

Acipenser kikuchii JORDAN and SNYDER, Journ. College Sci. Tokyo, vol. 15, p. 302, pl. 15, figs. 1–2, 1901 (type locality: Misaki, Sagami Bay); Proc. U. S. Nat. Mus., vol. 30, p. 397, 1906 (type).

Depth 6⅖ to subcaudal origin; head 4¼, width 1¾. Snout 3⅔ in head, short, sharp; eye ? ; preoral length 1¾; interorbital 2$\frac{1}{10}$, longitudinally concave.

Plates of back 11, large, rugose or warty, without distinct spines; lateral plates 32, each with spine in front; ventral plates 11, smooth. No bony plates on body except few small ones between large anterior ones of dorsal series; body skin soft and smooth between plates; opercle rugose; cheeks with fine stellate prickles.

Dorsal origin entirely behind ventrals, front edge 1⅘ in head, with more than 60 rays; anal origin opposite last ⅖ of dorsal base, front edge 1¾ in head, with 40 rays; caudal 4⅛ in rest of body, front edge of subcaudal 1½ in head; pectoral 1⅗; ventral 2⅙.

Color ? Length, 1,800 mm. (Jordan and Snyder.)

Japan. The type was captured in the open sea at Misaki and prepared as a dry mounted specimen for the Museum of the Imperial University at Tokyo.

ACIPENSER DABRYANUS Duméril

Acipenser (*Antaceus*) *dabryanus* DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 4, p. 98, pl. 22, fig. 1, a-b, 1868 (type locality: Yantze-Kiang).

Acipenser (*Acipenser*) *dabryanus* DUMÉRIL, Hist. Nat. Poiss., Ganoides, vol. 2, p. 193, 1870 (type).

Acipenser dabryanus MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Jinsen and Ruganho, Korea).

Depth 8 to subcaudal origin; head 3¼, width 2⅕. Snout 1$\frac{9}{10}$ in head, elongate, narrowly triangular; eye 14½, 7¾ in snout; barbels near last ⅖ in snout length; interorbital 3⅖ in head.

Dorsal plates 12, each ending in rather large spine, rugose; 33 lateral plates, rather small and well spaced; ventrals 10, rugose, each with strong spine.

Dorsal falls close behind depressed ventral ends, front edge 2⅘ in head, rays 42; anal origin about opposite last ⅖ of dorsal base, front edge 3⅕ in head, rays 30; caudal equals head, front edge of subcaudal 1$\frac{9}{10}$; pectoral 2; ventral 3$\frac{1}{10}$.

Back brown to lateral keels, rest of body yellowish white with silvery sheen on belly. Length, 350 mm. (Duméril.)

Yang-tze-kiang, China, Korea.

ACIPENSER CHINENSIS Gray

Acipenser chinensis GRAY, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 98, fig. 5, 1832–34 (type locality: China).—RICHARDSON, Ichth. China Japan, p. 198, 1846 (China).—GRAY, List fish British Museum, vol. 1, p. 6, 1851 (China).

Acipenser (*Acipenser*) *chinensis* DUMÉRIL, Hist. Nat. Poiss., Ganoides, vol. 2, p. 191, 1870 (China, probably Hong Kong).

Acipenser sinensis GRAY, Proc. Zool. Soc. London, 1834, p. 122 (China).—FITZINGER and HECKEL, Ann. Wiener Mus., Zool. Abhandl., vol. 1, p. 275, 1836 (copied).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 338, 1870 (types).—

Sauvage and De Thiersant, Ann. Sci. Nat., ser. 6, vol. 1, Zool., p. 18, 1874 (China).—Elera, Cat. Fauna Filip., vol. 1, p. 63, 1895 (Luzon, Cavite, Santa Cruz [doubtful, perhaps imported market specimens]).—Nichols, Bull. Amer. Mus. Nat. Hist., vol. 58, art. 1, p. 2, 1928 (reference).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Reisul, Korea).—Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 15, fig. 11, 1929 (Amoy).—Fowler, Hong Kong Nat., No. 6, p. 4, 1938 (Hongkong).

Depth 6⅔ to subcaudal origin; head 2⅔. Snout 1⅞ in head, elongately triangular; eye 14¾, 8 in snout; barbels short, thin, much nearer eye than snout tip; interorbital moderately low.

Dorsal plates 17, with strong spine and rugose striate; 40 or 41 lateral plates, each with keel, overlapping; vertical row of minute denticles between preopercle and opercle, skin of body otherwise entirely smooth.

Dorsal origin close behind ends of depressed ventrals, front fin edge 2⅘ in head, rays 50; anal begins nearly opposite middle of dorsal base, fin length 3⅗; caudal 1⅙ in head, front subcaudal edge 2½; pectoral 2⅓; ventral 4⅕.

Back dull plum color to row of lateral scutes, rest of body more or less pale brownish on fins and armature, otherwise whitish. (Gray; Günther.)

China, Amoy, Korea. Duméril's specimen was 280 mm. and he gives dorsal rays 47, anal 30.

Series TELEOSTEI

Skeleton bony, firm. Air bladder, if present, not cellular or functional as lung, usually simple or with slender duct communicating with intestinal tract. Optic nerves crossing, not forming solid chiasma. Arterial bulb thin, with pair of opposite valves. Intestine simple, without spiral valve. Armature, when present, usually of scales of rounded design. Tail homocercal.

The remaining vast group of living fishes, not included in the small series of ganoids, is included in the present assemblage. It contains largely very heterogeneous orders, sometimes made up of various forms apparently dissimilar.

Order Isospondyli

Bones of jaws developed. Maxillary wide, distinct from premaxillary, forms part of upper edge of mouth gape. Opercular apparatus distinct, complete. Pharyngeal bones simple above and below, lower not scythe shaped. Gill openings wide. Gills four, slit behind fourth. Air bladder small or absent, with duct when present. Skeleton mostly firmly ossified. Symplectic bone present. No interclavicles. Front vertebrae simple, not modified, without auditory ossicles. Mesocoracoid arch always well developed, forms bridge from hypercoracoid to hypocoracoid. Shoulder girdle well developed, joined to cranium by bony post-temporal. Scales usually cycloid. No developed photophores. Dorsal and anal fins without true spines. Ventrals abdominal, sometimes absent.

A large group of marine fishes, seldom in fresh water, the fossils fewer though better represented than most bony fishes. As some show characters like those of the higher ganoids or bowfins, these have been thought to suggest possible lines of descent.

ANALYSIS OF FAMILIES

a^1. CLUPEOIDEI. Scales cycloid, absent from head; mouth without barbels.

b^1. Dorsal median, not far posterior.

c^1. Lateral line present.

d^1. Branchiostegals 12 to 20 or more.

e^1. Gular plate present between each ramus of lower jaw; mouth large; teeth small, pointed; axillary scales and sheaths large; dorsal median or before anal ---------- **Elopidae**

e^2. No gular plate at chin.

f^1. Dorsal median, over ventral; mouth inferior ---------- **Albulidae**

f^2. Dorsal post median, over anal; mouth superior or terminal. **Osteoglossidae**

d^2. Branchiostegals 4 to 9.

g^1. Anal short, posterior.

h^1. Dorsal median, rays few ---------- **Chanidae**

h^2. Dorsal extensive over back, rays numerous -- **Pterothrissidae**

g^2. Anal greatly elongate, confluent with abortive caudal; dorsal small or absent ---------- **Notopteridae**

c^2. No lateral line.

i^1. Stomach gizzardlike; mouth small, inferior, toothless; maxillary simple or nearly so ---------- **Dorosomidae**

i^2. Stomach not gizzardlike.

j^1. Mouth moderate, terminal; maxillary usually in 3 pieces.

k^1. Belly rounded, covered with ordinary scales; supplemental maxillary very narrow ---------- **Stolephoridae**

k^2. Belly compressed, with bony serrae; supplemental maxillary broad ---------- **Clupeidae**

j^2. Mouth very large, partly to quite inferior, below tapering piglike snout; maxillary very long ---------- **Engraulidae**

b^2. Dorsal far back, opposite anal; teeth large ---------- **Chirocentridae**

a^2. GONORYNCHOIDEI. Scales ctenoid, covering head as well as body; mouth with barbels ---------- **Gonorynchidae**

Family ELOPIDAE

Body elongate or oblong, mostly compressed. Mouth large, terminal, lower jaw conspicuous, lateral borders of jaws formed by maxillaries. Premaxillaries short, not protractile. Maxillary with two supplemental bones. Elongate bony gular plate between branches of lower jaw. Villiform teeth in jaws, on vomer, palatines, pterygoids, and tongue. Gill rakers rather long. Gill membranes free, separated. Pseudobranchiae present or absent. Branchiostegals numerous, over 20. Air bladder large. Scales cycloid. Belly without keels or scutes. Head naked, with collar of large thin scales around occiput. Paired fins with long, scaly axillary flaps. Lateral line straight, with simple or branched tubes. Dorsal slightly behind ventral origin. Anal far behind dorsal. Caudal forked. Pectorals low, fold like ventrals. Ventral rays 10 to 16.

Widely distributed in tropical and subtropical seas, sometimes entering fresh water. Genera few. Though of large or moderate size not valued as food, as the rank flesh is full of numerous small bones. The young pass through a metamorphosis, like the *Leptocephalus* stage of the eels, though easily known by their forked tails.

ANALYSIS OF GENERA

a^1. Body deep, oblong; scales large; last dorsal ray ends in filament__ **Megalops**

a^2. Body slenderer; scales small; fins without filaments________________ **Elops**

Genus MEGALOPS Lacépède

Megalops LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 289, 1803. (Type, *Megalops filamentosus* Lacépède = *Clupea cyprinoides* Broussonet, monotypic.) (Precludes *Megalops* Leach 1814, Rafinesque 1815, Dejean 1833, Erichson 1840, Hallowell 1860.)

Brisbania CASTELNAU, Proc. Linn. Soc. New South Wales, vol. 2, p. 241, 1878. (Type, *Brisbania staigeri* Castelnau, monotypic.)

Tarpon JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, 1896, p. 409. (Type, *Megalops atlanticus* Valenciennes, monotypic.)

Body oblong, elongate, well compressed. Eyes large, with adipose lids. Mouth very large, oblique, reaches behind eye. Teeth in jaws, on vomer, palatines, pterygoids and tongue villiform. Gill rakers lanceolate. Pseudobranchiae absent. Branchiostegals 23 to 27. Scales large, tough, silvery. Anal without basal scaly sheath, though basally with smaller scales. Lateral line with branched tubes. Dorsal inserted little or well behind ventrals, little shorter than anal, last ray greatly elongated. Ventral rays 10 or 11.

Tropical seas, entering rivers. The young pass through a long ribbonlike transparent larval stage.

MEGALOPS CYPRINOIDES (Broussonet)

Clupea cyprinoides BROUSSONET, Ichth., no pagination, pl. 9, 1782 (type locality: Oceans between the Tropics [not Jamaica and Antigua or Rio Janeiro, Brazil]; Tanna Island, South Pacific).—BONNATERRE, Tabl. encyl. Ichth., p. 187, pl. 75, fig. 314, 1788 (Pacific Ocean).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1407, 1789 (copied).—WALBAUM, Artedi Pisc., vol. 3, p. 40, 1792 (copied).—BLOCH, Naturg. ausländ. Fische, vol. 9, p. 32, pl. 403, 1795 (Pacific Ocean, Tanna).—SCHNEIDER, Syst. Ichth. Bloch, p. 427, 1801 (Tranquebar).—LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 424, 458, pl. 13, fig. 3, 1803 (Pacific Ocean).—LICHTENSTEIN, Descr. Anim. Forster, p. 296, 1844 (Tanna Island).

Megalops cyprinoides SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, p. 292, 1838 (on Bloch).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 471, 1858 (Zanzibar, Shire River, Madras, Bengal, Pinang, Java, Sumatra, Amboina, East Indies, Formosa, Aneiteum, Cape York, Port Essington).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 85, pl. (12) 270, fig. 4, 1866–72 (Java and Celebes).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 37, 1874 (Kandavu; Upolu).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 2, p. 364, 1878 (Port Darwin).—GÜNTHER, Philos. Trans. Roy. Soc. London, vol. 168, p. 471, 1879 (Rodriguez).—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Viti; Samoa).—GÜNTHER, Rep. Voy. *Challenger*, vol. 1, p. 33 (Mary River, Queensland), p. 36, 1880 (Ovalau, Fiji).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 383, 1880 (Hawkesbury River; Port Darwin).—SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 5, p. 107, 1881 (Swatow).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 262, 1881 (reference); vol. 8, p. 210, 1883 (Lower Burdekin River, Queensland), p. 278, 1884 (Goldie River in fresh water, New Guinea).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 88, pt. 1, 1883, p 1108, 1884 (=*Brisbania staigeri*).—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Samoa).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 43, 1885 (Kordo, Mysore).—OGILBY, Cat. Fish. New South Wales, p. 57, 1886 (compiled).—DAY, Fauna British India, Fishes, vol. 1, p. 402, fig. 126, 1889.—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 497, pl. 49a, fig. 3, 1891 (Onilahy or Saint Augustin; Morondewa, Titsobohana, Mammambolo).—KENT, Great Barrier Reef, pp. 302, 370, pl. 45, fig. 6, 1893 (Rockhampton; Queensland).—ELERA, Cat. Fauna Filip., vol. 1, p. 584, 1895 (Manila, Luzon).—RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 63 (compiled).—KENT, Naturalist in Australia, p. 175, 1897 (Moreton Bay).—SEALE, Occ. Pap. Bishop Mus., vol. 1, No. 3, 1900, p. 63, 1901 (Guam).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 327, 1902 (Formosa, Giran).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, 1903, p 186, 1904 (Kuala Lumpur).—JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 770, 1905 (Negros).—SEALE, Occ. Pap. Bishop Mus., vol. 4, No. 1, p. 63, 1906 (Tubuai, Austral Islands).—JORDAN and SEALE, Bull. Bur. Fisher., vol. 25, (1905), p. 185, 1906 (Apia).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 615, 1906 (Nafa; Tokyo).—EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26, 1906, p. 53, 1907 (Bulan and Tarlac).—JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 32, p. 492, 1907 (Okinawa).—LLOYD, Rec. Indian Mus., vol. 1, p. 221, 1907 (Akyab).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 270, 1908–11 (Natal).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 387, 1909 (Indian Ocean, South Sea, Society Islands).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 165, 1909 (copied).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 204 (Apia).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 489, 1912 (Naha, Okinawa).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 589, 1912 (Batavia).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 52, 1913.—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 5, fig. 4, 1913 (Batavia, Tambak, Sumur, Makassar, Ceram, Merauke).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 1, 1913 (Macassar); Nova Guinea, vol. 9, p. 515, 1913 (Lorentz River, Alkmaar, Merauke).—OGILBY, Commercial Fish. Fisher. Queensland, p. 46, 1915 (Brisbane); Mem. Queensland Mus., vol. 5, p. 96, 1916 (Queensland coast).—CHAUDHURI, Mem. Indian Mus., vol. 5, p. 417, 1916.—ROUGHLEY, Fishes of Australia, p. 11, pl. 1, 1916 (north and east coasts, New South Wales).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 292, 1917 (reference).—FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines).—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 175, 1923 (Nontaburi); Mem. Asiatic Soc. Bengal, vol. 6, p. 479, 1924 (Tale Sap, Inner Lake).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—FOWLER, Bishop Mus. Bull. 22, p. 4 (Guam), p. 31, 1925 (Samoa).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 104, fig. 11, 1925 (young).—OSHIMA, Annot. Zool. Japon., vol. 11, p. 2, 1926 (Haiha, Hainan).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1ᵉ note, p. 7, 1926 (Gulf of Siam).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 15, pl. 4, fig. 46a, 1927.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1927, p. 256 (Philippines, San Fernando, Vigan, Orani).—HERRE, Philippine Journ. Sci., vol. 34, p. 296, 1927 (Lake Taal; Mindoro).—FOWLER, Mem. Bishop Mus., vol. 10, p. 27, 1928 (Guam, Tubuai, Apia).—MCCULLOCH, Australian Mus. 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Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 25, 1936 (New Hebrides, Tahiti, Fiji).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 129, 1937 (Bangkok).—SUVATTI, Index Fish. Siam, p. 8, 1937 (Maenam Canthaburi, Samut Prakan, Ko Tau).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 18, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 11, 1937 (Pulau Ubi near Singapore).—FOWLER, List Fish. Malaya, p. 21, 1938 (reference).

Elops cyprinoides PETERS, Monatsb. Akad. Wiss. Berlin, p. 272, 1868 (Bicol R., Luzon).—MARTENS, *in* von der Decken's Reise Ost Afrika, vol. 3, pt. 1, 1859–61, p. 143, 1869 (Pangani River, Kisanga Peninsula, Sumpfeat Limbo and Kilimane, Zanzibar, Tette and Boror).

Clupea thrissoides (part) SCHNEIDER, Syst. Ichth. Bloch, p. 424, 1801 (Atlantic and Pacific Oceans). (On Broussonet.)

Megalops filamentosus LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 289, 290, pl. 13, fig. 3, 1803 (type locality: Fort Dauphin, Madagascar).—SWAINSON, Nat. Hist. Animals, vol. 2, p. 293, 1839 (on *Kundinga* Russell, Fishes of Coromandel, vol. 2, p. 81, pl. 203, 1803, Vizagapatam).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 86, pl. (15) 273, fig. 1, 1866–72 (Java, Madura, Bali, Timor, Ceram).

Cyprinodon cundinga BUCHANAN-HAMILTON, Fishes of Ganges, pp. 254, 283, 1822 (type locality: Salt-water estuaries of Ganges River).

Elops cundinga CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1271, 1849 (sea and fresh water, Pinang, Malayan Peninsula).

Megalops kundinga JERDON, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 87, pl. (16) 274, fig. 1, 1866–72 (Java).

Megalops setipinnis RICHARDSON, Ann. Mag. Nat. Hist., vol. 11, p. 493, 1843 (type locality: Port Essington and Coburg Peninsula); Ichth. China Japan, p. 310, 1846 (Chinese Seas).

Clupea setipinna (Forster) VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 285, 1846 (Tahiti). (Name in text.)

Megalops setipinna BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 345, 1863 (Madagascar).

Megalops curtifilis RICHARDSON, Ichth. China Japan, p. 310, 1846 (type locality: Chinese Seas).

Megalops indicus VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 388, pl. 542, 1846 (type locality: Fort Dauphin, Madagascar; Mauritius; Bouru; Coromandel; Pondicherry; Malabar; Alipey; Canaror; Panimbang; Java; Tahiti; Tanna).—KNER, Reise *Novara*, Fische, p. 339, 1865 (Java).—STEINDACHNER, Sitz, Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 56, pt. 1, p. 319, 1867 (Cape York).

Megalops macrophthalmus BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 1, p. 421, 1850 (type locality: Batavia, Java); Verh. Batav. Genootsch. (Chiroc.), vol. 24, p. 15, 1852 (Batavia).

Elops apalike (not Lacépède) DAY, Fishes of Malabar, p. 228, 1865 (Malabar).

Megalops macropterus BLEEKER, Nederland. Tijdschr. Dierk., vol. 3, p. 284, 1866 (type locality: Java, Sumatra, Singapore, Bintang, Celebes, Amboina); Atlas Ichth. Ind. Néerland., vol. 6, p. 85, pl. (15) 273, fig. 2, 1866–72.—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 594, 1883 (New Guinea).

Megalops oligolepis BLEEKER, Nederland. Tijdschr. Dierk., vol. 3, p. 292, 1866.

Brisbania staigeri CASTELNAU, Proc. Linn. Soc. New South Wales, vol. 2, p. 241, pl. 3, 1878 (type locality: Brisbane River, Queensland).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 258, 1881 (reference); vol. 8, p. 288, 1882 (Lower Burdekin River).—KENT, Great Barrier Reef, pp. 302, 370, 1893.

Depth 3⅛ to 3¾; head 3¼ to 3⅗, width 2 to 2½. Snout 3⅞ to 4½ in head from snout tip; eye 3 to 3⅘, greater than snout or interorbital, with moderately narrow adipose lid, most evident with age; maxillary reaches opposite or little beyond hind eye edge, expansion 1⅘ to 2¾ in eye, length 1⅔ to 1⅘ in head from snout tip; interorbital 4¼ to 5½, convex; slender gular plate 2⅘ to 3 in head measured from tip of mandible. Gill rakers 15 to 17+30 or 31, lanceolate, ¼ longer than gill filaments, which ½ of eye.

Scales 35 to 37 in lateral line to caudal base and 3 or 4 more on latter; 5 or 6 above, 6 below, 12 to 20 predorsal. Tubes of lateral line with 3 or 4 branches. Scales rather narrowly imbricated, smaller on caudal base, small and crowded on anal base. Scales with about 10 to 16 basal radiating striae, reticulations medially.

D. IV or V, 13, I to 15, I, fourth simple ray 1⅛ to 1¾ in total head length; A. IV, 19, I to 23, I, fourth simple ray 1⅖ to 3⅕; least depth of caudal peduncle 2¾ to 3⅓; pectoral 1⅓ to 1⅔; ventral 1⅞ to 2¼; caudal deeply forked, 3 to 3⅘ in rest of body.

Back brown, sides and below silvery white. Vertical fins and pectorals above gray to dusky, otherwise fins whitish.

Zanzibar, East Africa, Natal, Madagascar, Rodriguez, India, Ceylon, Malacca, East Indies, Philippines, China, Riu Kiu, Japan, Formosa, Queensland, New South Wales, North Australia, West Australia, Melanesia, Micronesia, Polynesia. Though marine it sometimes enters fresh waters. In my Fishes of Oceania the lower gill rakers are given as 13; they should have read 33.

5986 [748]. Cavite market. December 1, 1908. Length, 148 mm.

21001. Creek below Pancol, Malampaya Island, Palawan. December 26, 1908. Length, 195 mm.

22248, 22350 to 22355. Dampalit, near Malabon. August 10, 1908. Length, 95–192 mm.

6058. Dumaca River, Luzon. February 25, 1909. Length, 218 mm.

6639. Iloilo market. March 28, 1908. Length, 215 mm.

5824. Iwahig River and tributary. April 4, 1909. Length, 178 mm.

7401. Malaga River, Hinunangan Bay, Leyte Island. July 30, 1909. Length, 212 mm.

1 example. Malabon market. August 8, 1908. Length, 103 mm.

4908, 4909, 4913, 18935, 18936. Malinao River, Palawan. April 2, 1909. Length, 183–245 mm.

9082 to 9084. Manila market. June 24, 1908. Length, 240–247 mm. 4 examples.

7175 and 7177. Panguran River, Port Caltom. December 16, 1908. Length, 204–244 mm.

22290. River at Port Dupon, Leyte. In brackish water. March 17, 1909. Length, 123 mm.

12624, 12625. Santiago River, Pagapas Bay, Luzon. February 20, 1909. Length, 185–228 mm.

U.S.N.M. No. 30509. New Guinea. Australian Museum. Length, 343 mm.

U.S.N.M. No. 30540. New Guinea. Australian Museum. Length, 300 mm., caudal damaged.

U.S.N.M. No. 47800. No locality. Length, 390 mm.

U.S.N.M. No. 47902. Port Jackson. Length, 518 mm.

U.S.N.M. No. 51970. Negros, Philippines. Dr. Bashford Dean. Length, 68–70 mm., caudal tips damaged. 2 examples.

U.S.N.M. No. 52355. Apia, Samoa. Bureau of Fisheries. Length, 108–206 mm. 5 examples.

U.S.N.M. No. 56077. Philippines. Bureau of Fisheries (4183). Length, 440 mm., caudal largely broken off.

U.S.N.M. No. 59005. Bacon, Philippines. Bureau of Fisheries (4052). Length, 243 mm.

U.S.N.M. No. 59863. New South Wales. Length, 424 mm.

U.S.N.M. No. 72088. Nafa, Okinawa, Riu Kiu. *Albatross* collection. Length, 229 mm.

U.S.N.M. No. 72488. Batavia, Java. April 2, 1909. Bryant and Palmer. Length, 268 mm.

U.S.N.M. No. 72489. Batavia. 1909. Bryant and Palmer. Length, 240–250 mm. 3 examples.

U.S.N.M. No. 86978. Foochow, China. A. de C. Sowerby. Length, 245 mm. 2 examples. A.N.S.P. Apia, Samoa. U. S. Fish Commission. Length, 192–197 mm. From one example I took a small *Apogon* in good preservation.

Genus ELOPS Linnaeus

Elops LINNAEUS, Syst. Nat., ed. 12, vol. 1, p. 518, 1766. (Type, *Elops saurus* Linnaeus, monotypic.)

Mugilomorus LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 397, 398, 1803. (Type, *Mugilomorus anna-carolina* Lacépède, monotypic.)

Trichonotus (not Schneider 1801) RAFINESQUE, Analyse de la nature, p. 88, 1815. (Type, *Mugilomorus anna-carolina* Lacépède, virtually. *Trichonotus* Rafinesque, proposed to replace *Mugilomorus* Lacépède.)

Body elongated. Mouth little inclined. Maxillaries very long. Fine teeth in jaws, on vomer, palatines, pterygoids, and tongue. Pseudobranchiae well developed. Branchiostegals 27 to 34. Vertebrae 63 to 79, of which 29 caudal. Scales small, thin. Dorsal and anal both depressible in basal scaly sheaths. Paired fins each with long scaly flap. Lateral line straight, tubes simple. Dorsal slightly behind ventrals. Anal similar, smaller. Paired fins moderate. Ventral rays 17 or 18.

Large fishes of tropical or subtropical seas, sometimes entering tidal rivers. All are brilliant silvery in color. Young transparent, bandlike, changing with age like those of *Megalops* and *Albula.*

ELOPS SAURUS Linnaeus

Elops saurus LINNAEUS, Syst. Nat., ed. 12, vol. 1, p. 518, 1766 (type locality: Carolina).—CUVIER, Règne animal, vol. 2, p. 177, 1817 (reference).—VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 365, 1847 (Massauah, Red Sea, Mauritius, Pondicherry, Coromandel).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1269, 1849 (Sea of Pinang).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.—BLEEKER Verh. Batav. Genootsch. (Japan), vol. 25, p. 18, 1853 (Japan); Nat. Tijdschr. Nederland. Indië, vol. 21, p. 56, 1860 (reference).—GUICHENOT, Notes ile Réunion, vol. 2, p. 29, 1863.—KNER, Reise *Novara*, Fische, p. 338, 1865 (Madras).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 84, pl. (10)218, fig. 3, 1866–72 (Java, Madura, Pinang, Singapore, Celebes).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 470, 1868 (Zanzibar, Djedda, Pinang, China, Cape of Good Hope).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 603, 1871 (Red Sea).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 147, 1874 (compiled).—DAY, Fishes of India, pt. 4, p. 649, pl. 166, fig. 1, 1878.—CASTELNAU, Proc. Linn. Soc. New South Wales, vol. 2, p. 241, 1878 (Singapore, Malacca, Cape of Good Hope, Brisbane).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 382, 1880 (Port Jackson); vol. 6, p. 261, 1881 (Port Jackson; north coast); vol. 7, p. 594, 1883 (New Guinea); vol. 8, p. 210, 1883 (Lower Burdekin River).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 42, 1885 (North Celebes).—OGILBY, Cat. Fish. New South Wales, p. 56, 1886 (reference).—BOULENGER, Proc. Zool. Soc. London, p. 666, 1887 (Muscat).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 497, pl. 49a, fig. 4, 1891.—KENT, Great Barrier Reef, pp. 302, 307, 1893 (Cooktown, Townsville, Bowen.)—ELERA, Cat. Fauna Filip., vol. 1, p. 584, 1895 (Luzon, Manila Bay).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 8, 1897.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, p. 406, 1900 (Hawaiian Islands).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, Math.-nat. Kl., vol. 70, p. 513, 1901 (Honolulu).—JENKINS, Bull. U. S. Fish Comm., vol. 22

(1902), p. 432, 1904 (Honolulu).—WAITE, Rec. Australian Mus., vol. 6, pt. 2, p. 58, 1905 (Murray River near Mandurah).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), p. 53, 1905 (Honolulu).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 616, fig. 1, 1906 (compiled).—EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26 (1906), p. 53, 1907 (Bulan).—JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 32, p. 492, 1907 (Okinawa).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27 (1907), p. 235, 1908 (Manila).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 270, 1908–11 (Natal).—BOULENGER, Catalogue fresh water fishes Africa, vol. 1, p. 25, fig. 17, 1909 (Senegal, Zanzibar, East Africa, Cape of Good Hope).—FRANZ, Abh. Bayer. Akad. Wiss., vol. 4, Suppl. vol. 1, p. 4, 1910 (Sagami Bay and Aburatsubo).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 50, pl. 2, 1913 (Algoa Bay, East London, Natal, Delagoa Bay).—BOULENGER, Catalogue fresh water fishes of Africa, vol. 4, p. 152, 1916 (note).—IZUKA and MATSUURA, Cat. Zool. Spec. Mus. Tokyo, Vertebr., p. 184, 1920 (Tokyo market).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 103, pl. 6, fig. 1, 1925 (Port Elizabeth to Delagoa Bay).—OSHIMA, Annot. Zool. Japon., vol. 11, p. 2, 1926 (Haiho, Hainan).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 354, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e Note, p. 123, 1929 (Cochin China).

Argentina machnata FORSKÅL, Descript. Animal., pp. XIII, 68, 1775 (type locality: Djedda, Red Sea).—BONNATERRE, Tableau encyclop. Ichth., p. 176, 1788 (Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1395, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 46, 1792 (copied).—LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 365, 367, 1803 (Arabia).—SHAW, General zoology, vol. 5, p. 129, 1804.

Elops machnata RÜPPELL, Neue Wirbelth., Fische, p. (80)84, 1835 (Red Sea).—RICHARDSON, Ichth. China Japan, p. 311, 1846 (Canton; seas of China); Voy. *Erebus* and *Terror*, Fishes, p. 59, pl. 30, figs. 3–5, 1846 (China).—SCHLEGEL, *in* Siebold's Fauna Japonica, Pisces, pts. 10–15, 241, pl. 109, fig. 2, 1850 (Southwest coast Japan; Korea).—DAY, Fishes of Malabar, p. 227, 1865.—GÜNTHER, Fishes of Zanzibar, p. 121, figs. (tails), 1866 (Zanzibar).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 497, pl. 49a, fig. 4, 1891.—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 52, 1901 (reference).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 327, 1902 (Formosa, Suwata).—REGAN, Ann. Mag. Nat. Hist. ser. 8, vol. 3, p. 39, 1909 (Madras, Cape of Good Hope, South Africa, China, Lake Nyasa, Shiré River).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 589, 1912 (Batavia).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 4, 1913 (note).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 29, 1917 (references).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 119, 1925 (Misaki and Kobe markets).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—FOWLER, Hong Kong Nat. vol. 2, p. 50, 1931 (compiled); List Fish. Malaya, p. 21, 1938 (reference).

Elops indicus SWAINSON, Nat. Hist. Animals, vol. 2, p. 292, 1839 (on *Jinagow* Russell, Fishes of Coromandel, vol. 2, p. 63, pl. 179, 1803, type locality: Vizagapatam).

Elops capensis ANDREW SMITH, Ill. zool. South Africa, Fishes, pl. 7, 1849 (type locality: Cape of Good Hope).—CASTELNAU, Mem. Poiss. Afrique Australe, p. 67, 1861 (Port Natal).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 50, pl. 2, 1913 (Natal).

Elops purpurascens Richardson, Ichth. China Japan, p. 311, 1846 (type locality: Chinese Seas).

Elops australis Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 3, p. 39, 1909 (type locality: New South Wales).

Elops hawaiensis Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 3, p. 39, 1909 (type locality: Hawaii).—Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 165, pl. 66, upper fig., 1909 (Takao).—Günther, Journ. Mus. Godeffroy, pt. 16, p. 386, 1909 (Hawaii).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 204 (Honolulu).—Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 489, 1912 (Naha, Okinawa).—Weber, *Siboga* Exped., Fische, vol. 57, p. 1, 1913 (Macassar).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 3, fig. 2, 1913 (Batavia and Macassar).—Ogilby, Commerc. Fish. Fisher. Queensland, p. 46, 1915 (Brisbane); Mem. Queensland Mus., vol. 5, p. 96, 1916 (Queensland coast).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 256, 1927 (Orani, Philippines).—McCulloch, Fishes of New South Wales, ed. 2, p. 15, pl. 4, fig. 45a, 1927.—Whitley, Journ. Pan-Pacific Res. Inst., vol. 2, No. 1, p. 3, 1927 (Fiji).—Jordan, Journ. Pan Pacific Inst., vol. 2, No. 4, p. 3, 1927 (Samoa).—Fowler, Mem. Bishop Mus., vol. 10, p. 26, 1928 (Honolulu; Hilo).—McCulloch, Austral. Mus. Mem. vol. 5, p. 34, 1929 (reference).—Fowler, Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (Honolulu).—Chevey, Inst. Océanogr. Indochine, 19^e^ note, p. 8, 1932 (Cochin China).—Roxas, Philippine Journ. Sci., vol. 55, p. 238, pl. 1, fig. 11 (scale), 1934 (Manila).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 18, 1937 (reference).

Elops hawaiiensis Fowler, Copeia, No. 58, p. 62, 1918 (Philippines); No. 112, p. 82, 1922 (Hawaii); Bishop Mus. Bull. 22, p. 23, 1925 (Honolulu).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 13, 1934 (Manila; Capiz; Dumaguete).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 11, 1937 (Singapore).

Depth 4⅘ to 5¼; head 3½ to 4, width 2⅖ to 2⅔. Snout 3⅚ to 4⅓ in head from snout tip; eye 4⅛ to 6¼, 1⅕ to 1⅔ in snout, little greater than interorbital in young to 1⅓ in interorbital with age, adipose lids broad; maxillary reaches well beyond eye, expansion 1⅖ to 1¾ in eye, length 1¾ to 1⅞ in head; teeth in finely villiform bands in jaws, small patch on vomer and wide areas on palatines and tongue; interorbital 4⅛ to 5½, depressed or slightly concave, at least medially. Gill rakers 7 or 8+16 or 17, lanceolate, about 1½ in eye.

Scales 85 to 95 in lateral line to caudal base, 7 or 8 more on latter; 12 or 14 scales above, 9 or 10 below, 38 to 46 predorsal. Scales with 13 to 18 basal striae; circuli very fine, none apical.

D. v to viii, 17, i or 18 i, fifth to eighth simple ray 1½ to 1⅔ in total head length; A. iv or v, 11, i or 12, i, fourth or fifth simple ray 2 to 2⅗; least depth of caudal peduncle 3 to 3⅛; pectoral 1⅞ to 2; ventral 1⅞ to 2; caudal 3½ in rest of body.

Back and head above brown, sides and below bright silvery white. Fins all pale brownish. Dorsal and caudal terminally with pale brownish, fins otherwise whitish. Iris silvery white.

Red Sea, Arabia, Zanzibar, Delagoa Bay, Natal, Cape of Good Hope, Mauritius, Réunion, Madagascar, India, Pinang, East Indies, Philippines, Hainan, China, Formosa, Japan, Korea, Queensland, New South Wales, Hawaii. Also in the tropical Atlantic. I feel obliged to consider the nominal species described by Regan as *Elops hawaiensis* and *Elops australis* as synonyms. Likewise his interpretation of *Elops machnata* breaks down upon a survey of the materials before me. The distinctions used in grouping *Elops machnata* and *Elops lacerta* with "mandible projects, covers front part of premaxillary band of teeth when mouth closes" will not hold, as various conditions occur. Thus in some specimens the mandible is shorter than the snout, or it may protrude, but never covers or conceals the premaxillary teeth, even with age. *Elops machnata* and *Elops lacerta* may hold on their fewer vertebrae 63 or 64, compared with 78 or 79 for the other species.

22346. Dampalit, near Malabon. August 10, 1908. Length, 135 mm. Lower gill rakers 14.

13186. Iloilo market. June 1, 1908. Length, 179 mm. Lower gill rakers 15.

U.S.N.M. No. 8020. Hong Kong, China. William Stimpson. Length, 353 mm. Scales 84+7. Lower gill rakers 14.

U.S.N.M. No. 47921. Port Jackson. Australian Museum. Length, 600 mm., caudal broken. Scales 87+7. Gills taken out.

U.S.N.M. No. 51032. Hawaiian Islands. Bureau of Fisheries. Length, 273 mm. Scales 90+10. Lower gill rakers 13.

U.S.N.M. No. 55455. Hawaiian Islands. U. S. Bureau of Fisheries. Length, 228–277 mm. Scales 83 to 86+9 or 10. Lower gill rakers 13 to 15. 3 examples.

U.S.N.M. No. 59853. New South Wales. D. G. Stead. Length, 460–470 mm., caudals broken. Scales 89 to 93+10. Lower gill rakers 14 or 15. 2 examples.

U.S.N.M. No. 71890. Okinawa, Riu Kiu. *Albatross* collection. Length, 288 mm. Scales 90+8. Lower gill rakers 15.

U.S.N.M. No. 72485. Batavia, Java. Bryant and Palmer. Scales 93+9. Lower gill rakers 15.

U.S.N.M. No. 72486. Batavia, Java. Bryant and Palmer. Scales 70+8. Lower gill rakers 15. Length 265 mm.

U.S.N.M. No. 72487. Batavia, Java. Bryant and Palmer. Scales 82+8. Lower gill rakers 14. Length, 253 mm.

U.S.N.M. No. 83103. Hilo, Hawaii. U. S. Exploring Expedition. Length, 735 mm.

U.S.N.M. No. 83444. No locality. U. S. Exploring Expedition. Fins.

A.N.S.P. No. 1181. Hawaiian Islands. Dr. W. H. Jones. Length, 266 mm.

Family ALBULIDAE

Body elongated, belly flattened. Snout conic, conspicuous, partly quadrangular. Eye medial. Mouth inferior, bordered above for greater extent by premaxillaries, and only hind part of edentulous maxillaries. Villiform teeth in jaws, on vomer and palatines; coarse blunt teeth on pterygoids, sphenoid, and tongue. Lower jaw without gular plate. Gill membranes widely separated, free. Pseudobranchiae present. Branchiostegals 12 to 16. Vertebrae about 70, of which 28 caudal. Air bladder large. Scales cycloid, brilliant silvery white. Head naked with few large scales forming occipital collar. Paired fins each with long scaly axillary flap. Lateral line complete. Dorsal moderate, before ventrals. No adipose fin. Anal very small, near caudal, far behind vent. Caudal deeply forked. Pectorals small, low. Ventrals small, rays 10 to 14.

World-wide in warm tropical seas, the species usually referred to *Albula*, though the West Indian *Dixonina* differing in the last dorsal and anal ray ending in an extended filament. The living *Albula* is also known from Eocene deposits and several other fossil genera have been referred to the family.

Genus ALBULA Scopoli

Albula Gronow, Zoophylacii, p. 102, 1763. (Species nonbinomial. "Le type est le Butirin macrocephale (*Clupea macrocephala* Lacépède)"=*Esox vulpes* Linnaeus, designated by Desmarest, Encyclop. Hist. Nat., Chenu, vol. 19, p. 309, 1874.) (*Albula* Osbeck, Reise durch China, p. 309, 1762. Type, *Albula chinensis* Osbeck=*Salanx* Cuvier 1817. Inadmissible.)

Albula Scopoli, Introd. Nat. Hist., p. 454, 1777 (on Gronow). (Type, *Esox vulpes* Linnaeus.)

Vulpis Catesby, Nat. Hist. Carolina, ed. 2, p. 1, 1771. (Type, *Esox vulpes* Linnaeus, tautotypic. Inadmissible.)

Butyrinus Lacépède, Hist. Nat. Poiss., vol. 5, p. 45, 1803. (Type, *Butyrinus bananus* Lacépède, monotypic.)

Butirinus Cuvier, Règne animal, ed. 2, vol. 2, p. 329, 1829. (Type, *Butyrinus bananus* Lacépède.)

Butirinis Bleeker, Nat. Geneesk. Arch. Nederl.-Indie, vol. 2, p. 509, 1845. (Type, *Butyrinus bananus* Lacépède).

Buturinus Valenciennes, Hist. Nat. Poiss., vol. 19, p. 316, 1847. (Type, *Butyrinus bananus* Lacépède.)

Glossodonta Cuvier, Mem. Mus. Hist. Nat. Paris, vol. 1, p. 232, 1815. (Atypic.) (Type, *Argentina glossodonta* Forskål, assumed tautonym.)

Glossodus (Cuvier) Agassiz, Pisc. Brasil. Spix, p. 48, 1829. (Type, *Argentina glossodonta* Forskål.)

Esunculus Kaup, Cat. Apodal Fish. British Mus., p. 143, 1856. (Type, *Esunculus costei* Kaup.) (Larva.)

Conorhynchos (not Bleeker 1858) Gill, Cat. Fish. East Coast North America, p. 55, 1861. (Type, *Butyrinus vulpes* Storer.) (*Conorhynchos* Motschoulsky 1860 in Coleoptera precluded.)

Atopichthys Garman, Mem. Mus. Comp. Zool., vol. 24, p. 326, 1899. (Type *Atopichthys esunculus* Garman, designated by Jordan, Genera of Fishes, pt. 4, p. 486, 1920.)

Body little compressed. Head moderate. Snout piglike, overlaps mouth. Eye large, with bony ridge above. Annular adipose eyelid nearly covers eye. Mouth small, horizontal. Maxillary strong, simple, with one supplemental bone. Gill rakers short tubercles. Scales forming regular horizontal or longitudinal series parallel with lateral line. Lateral line with simple tubes. Dorsal short, midway in body. Last dorsal and anal rays not extended. Pectorals short, folding like ventrals.

One species in all tropical seas, remarkable for its anatomical peculiarity in that the rudimentary conus arteriosus of the heart is furnished with two rows of valvules in place of one, though none of the ganoid fishes have less than three. Like related families, the young pass through larval stage, in which they are long, bandlike, transparent, and scaleless.

ALBULA VULPES (Linnaeus)

Esox vulpes LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 313, 1758 (type locality: Bahama Islands) (on *Bone fish* Catesby, Nat. Hist. Carolina, pl. 2, fig. 1, 1737, Bahamas); ed. 12, vol. 1, p. 516, 1766 (copied).

Synodus vulpes LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 321, pl. 8, fig. 2, 1803 (no locality).

Albula vulpes JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 52, 1901 (reference).—JENKINS, Bull. U. S. Fish Comm., vol. 22, (1902), p. 432, 1903 (Honolulu).—SNYDER, Bull. U. S. Fish Comm., vol. 22, 1902, p. 521, 1904 (Hanalei Bay, Kauai).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, 1903, p. 55, 1905 (Honolulu; Hilo).—SEALE, Occ. Pap. Bishop Mus., vol. 4, No. 1, p. 5, 1906 (Tahiti).—OGILBY, Proc. Roy. Soc. Queensland, vol. 21, p. 87, 1908 (Moreton Bay).—KENDALL and GOLDSBOROUGH, Mem. Mus. Comp. Zool., vol. 26, p. 242, 1911 (Funafuti; Ellice Islands).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Kagoshima market).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 7, fig. 5, 1913 (Batavia).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 53, 1913 (Natal).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 293, 1917 (reference).—MCCULLOCH, Rec. Australian Mus., vol. 12, No. 8, p. 172, 1919 (Sydney; Malekula, New Hebrides; Hood Bay, Papua).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 13, 1925 (reference).—FOWLER, Bishop Mus. Bull. 22, p. 4 (Guam) p. 23, 1925 (Honolulu).—FOWLER and BALL, Bishop Mus. Bull. 26, p. 5, 1925 (Lisiansky).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 106, 1925 (Natal coast).—FOWLER, Bishop Mus. Bull. No. 38, p. 5, 1927 (Christmas Island).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 15, pl. 4, fig. 47a, 1927.—FOWLER, Mem. Bishop Mus., vol. 10, p. 27, 1928 (Tahiti, Honolulu, Lisiansky, Guam, Funafuti, Society Islands).—MCCULLOCH, Austral. Mus. Mem., vol. 5, p. 35, 1929 (reference).—FOWLER, op. cit., vol. 11, p. 315, 1931 (Honolulu).—CHEVEY, Inst. Océanogr. Indochine, 19ᵉ note, p. 8, 1932 (Cochin China).—HERRE, Fishes Herre Philippine Exped. 1931, p. 13, 1934 (Jolo).—ROXAS, Philippine Journ. Sci., vol. 55, p. 242, pl. 1, fig. 12 (scale), 1934 (Cadiz Nuevo, Negros; Mekong R.).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 67, fig. 1 (Sanoer, Bali), p. 410 (Durban), 1934.—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, p. 12, 1935–36 (Mar Rosso).—FOWLER, Bull. Amer. Mus Nat. Hist., vol. 70, pt. 1, p. 158, fig. 62, 1936 (West Indies).—HERRE, Field Mus. Nat. Hist. Publ. 353, zool. ser., vol. 21, p. 26, 1936 (New Hebrides).—WHITLEY, Rec. Austral. Mus., vol. 20, No. 1, p. 6, fig. 2 (larva), 1937 (New Hebrides).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 18, 1937 (reference).—FOWLER, List Fish. Malaya, p. 22, 1938 (reference).

Argentina glossodonta FORSKÅL, Descript. Animal., pp. XIII, 68, 1775 (type locality: Djedda and Lohaja, Red Sea).—BONNATERRE, Tableau encyclop. Ichth., p. 177, 1788 (Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1394, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 45, 1792 (copied).—CUVIER, Mém. Mus. Hist. Nat. Paris, vol. 5, p. 371, 1819.

Butirinus glossodontus RÜPPELL, Neue Wirbelth., Fische, p. 80, pl. 20, fig. 3, 1835 (Djedda).—SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 242, pl. 109, fig. 3, 1846 (Japan; Korea).—GÜNTHER, Fishes of Zanzibar, p. 120, 1866 (Zanzibar).

Butirinus glossodonta LAY and BENNETT, Zool. Beechey's Voy., Fishes, p. 46, 1839 (Oahu).

Elops glossodontus SWAINSON, Nat. Hist. Animals, vol. 2, p. 292, 1839 (on Rüppell).

Conorhynchus glossodon BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 83, pl. (12)270, fig. 1, 1866–72 (Java, Madura, Bali, Sumatra, Pinang, Banka, Biliton, Celebes, Obi Major, Saparua, Ceram, New Guinea); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 300, 1868 (Waigiu).

Albula glossodonta KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 602, 1871 (Red Sea).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 70, p. 513, 1901 (Honolulu).—OGILBY, Mem. Queensland Mus., vol. 5, p. 96, 1916 (Queensland Coast).

Albula glossodon GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 385, 1909 (Society and Hawaiian Islands).

Esox argenteus SCHNEIDER, Syst. Ichth. Bloch, p. 395, 1801 (type locality: Australia, New Zealand).—LICHTENSTEIN, Descr. Anim. Forster, p. 196, 1844 (Tahiti), p. 256 (Tauna).

Synodus argenteus SCHNEIDER, Syst. Ichth. Bloch, p. 398, 1801 (no locality).

Clupea brasiliensis SCHNEIDER, Syst. Ichth. Bloch, p. 427, 1801 (type locality: Brazil).

Albula conorynchus SCHNEIDER, Syst. Ichth. Bloch, p. 432, 1801 (type locality: Antilles).

Albula conorhynchus VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 356, 1846 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 468, 1868 (Port Natal, Cape Verde, West Indies, Jamaica, Puerto Cabello, Belize, Bahia, Pacific coast Central America, New Hebrides, Singapore, Ceylon, Zanzibar, Red Sea).—STREETS, U. S. Nat. Mus. Bull. 7, p. 76, 1877 (Honolulu).—SCHMELTZ, Cat. Mus. Godeffroy, No. 6, p. 18, 1877 (Samoa).—DAY, Fishes of India, pt. 4, p. 648, 1878.—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Samoa).—GÜNTHER, Rep. Voy. *Challenger*, vol. 1, p. 61, 1880 (Hilo).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 593, 1883 (New Guinea); vol. 8, p. 278, 1884 (Hood Bay, New Guinea).—KENT, Great Barrier Reef, p. 302, 1893 (north Queensland).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e note, p. 123, 1929 (Phuroc-tinh).

Albula conorhyncus GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 269, 1908 (Natal).

Albula plumieri SCHNEIDER, Syst. Ichth. Bloch, p. 432, pl. 86, 1801 (on above).

Albula immaculata SCHNEIDER, Syst. Ichth. Bloch, p. 451, 1801 (type locality: Central America).

Butyrinus bananus (Commerson) LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 46, 1803 (type locality: No. locality=Mauritius ?).

Albula bananus VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 345, 1846 (Mauritius).—GUICHENOT, Notes ile Réunion, vol. 2, p. 29, 1863.—KNER, Reise *Novara*, Fische, p. 339, 1865 (Java).

Argentina bonuk Lacépède, Hist. Nat. Poiss., vol. 5, pp. 365, 366, 1803 (type locality: Arabian Sea).

Clupea macrocephala Lacépède, Hist. Nat. Poiss., vol. 5, 1803, pp. 426, 460, pl. 14, fig. 1, 1803 (type locality: Martinique).

Glossodus forskalii Agassiz, Pisc. Brasil. Spix, p. 49, 1829 (type locality: Bahia, Brazil).

Engraulis sericus (Spix) Agassiz, Pisc. Brasil. Spix, p. 49, pl. 23, fig. 2, 1829 (name in synonymy).

Engraulis bahiensis (Spix) Agassiz, Pisc. Brasil. Spix, p. 49, pl. 24, fig. 2, 1829 (type locality: Bahia).

Albula parrae Valenciennes, Hist. Nat. Poiss., vol. 19, p. 245, 1846 (type locality: Martinque, Bahia; Rio Janeiro).

Albula goreensis Valenciennes, Hist. Nat. Poiss., vol. 19, p. 248, 1846 (type locality: Goree, West Africa).

Albula neoguinaica Valenciennes, Hist. Nat. Poiss., vol. 19, p. 253, 1846 (type locality: New Guinea).

Albula seminuda Valenciennes, Hist. Nat. Poiss., vol. 19, p. 254, 1846 (type locality: New Guinea).

Albula erythrocheilos Valenciennes, Hist. Nat. Poiss., vol. 19, p. 540, 1846 (type locality: Friendly Islands).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1265, 1849 (Pinang).

Albula forsteri Valenciennes, Hist. Nat. Poiss., vol. 19, p. 256, 1846 (type locality: Tahiti).—Thiollière, Fauna Woodlark, p. 207, 1857 (Woodlark Island).

Albula rostrata Gray, Cat. fish Gronow, p. 189, 1854 (type locality: American Ocean, Indian and Mediterranean Seas).

Albula virgata Jordan and Jordan, Mem. Carnegie Mus., vol. 10, p. 6, pl. 1, fig. 1, 1922 (type locality: Honolulu and Hilo).

Depth 4 to 5¾; head 3⅓ to 3⅘, width 1⅞ to 2¾. Snout 2⅙ to 3 in head; eye 4⅛ to 4⅞, 1⅓ to 2 in snout, 1 to 1⅖ in interorbital, only narrow vertical aperture in adipose lid; maxillary not quite reaching eye, length 2⅘ to 3⅕ in head; teeth villiform, in bands in jaws, on vomer and palatines; interorbital 3 to 4, nearly level. Gill rakers viii + viii to xii, low tubercles.

Scales 69 or 70 in lateral line to caudal base and 6 or 7 more on latter; 9 scales above, 6 or 7 below, 23 to 28 predorsal. Scales with 3 basal radiating striae; circuli very fine.

D. iv or v, 14, i or 13, i, first branched ray 1⅖ to 1⅗ in head; A. iii, 6, i, first branched ray 2⅞ to 4; least depth of caudal peduncle 3⅓ to 3⅗; pectoral 1⅔ to 1¾; ventral 2⅛ to 2⅕; caudal 3⅖ to 3⅔ in rest of body.

Back gray-brown. Sometimes scale junctures on back show dark longitudinal streaks or lines above lateral line, all following within scale junctures. Sides and under surfaces bright or gleaming silvery white. Dorsal and caudal pale gray or brown, other fins whitish.

Red Sea, Zanzibar, Natal, Mauritius, India, Ceylon, Pinang, Singapore, East Indies, Japan, Korea, Queensland, New South Wales, Melanesia, Micronesia, Polynesia, Hawaii.

10789 to 10791, 13883. Matnog Bay, East Luzon. May 31, 1909. Length, 173–213 mm.

U.S.N.M. No. 18004. Honolulu. Dr. T. H. Streets. Length, 500 mm.

U.S.N.M. No. 52667. Hawaiian Islands. *Albatross* collection (03588). Length, 300 mm.

U.S.N.M. No. 55133. Hanalei River, Hawaiian Islands. *Albatross* collection. Length, 198–205 mm. 2 examples.

U.S.N.M. No. 65722. Funafuti. Bureau of Fisheries (08336). Length, 75 mm.

A.N.S.P. No. 25997. Durban, Natal. 1927. H. W. Bell Marley. Length, 238 mm.

Family OSTEOGLOSSIDAE

Body elongate, sides flattened and ventrally compressed. Mouth edge formed by premaxillaries and longer maxillaries. Teeth various. Subopercle much reduced, more or less concealed beneath preopercle. Gill openings wide. No pseudobranchiae. Branchiostegals 7 to 16. Stomach without blind sac. Pyloric coeca 2. No oviducts. Scales large to very large, cycloid, formed as mosaiclike. Head scaleless. Lateral line complete, with single tubes. Dorsal opposite anal, both approximated to rounded caudal. Pectorals low, folding against body. Ventral rays 5 or 6.

Fresh waters of South America, Africa, Indo-Australian Archipelago, and Australia. As here understood the family resolves into three subfamilies; the Osteoglossinae including the American *Osteoglossum* besides *Scleropages;* the American Arapaminae with *Arapamia;* the African Clupisudinae with *Clupisudis*, usually known by later *Heterotis*. The fossils *Phareodus* from the Wyoming Eocene and *Anogmius* from the Cretaceous of Kansas are evidently related forms. As Günther has shown, the distribution of the members of the family closely parallels that of the Dipnoi.

Genust SCLEROPAGES Günther

Scleropages Günther, Ann. Mag. Nat. Hist., ser. 3, vol. 14, p. 196, 1864. (Type, *Scleropages leichardti* Günther, monotypic.)

Delsmania Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 243, 1934. (Type, *Osteoglossum formosum* Schlegel and Müller, orthotypic.)

Body compressed ventrally to trenchant edge. Mouth cleft very wide, greatly inclined. Lower jaw prominent, with pair of barbels at tip. Maxillary very long, narrow. Jaws with series of small teeth and villiform teeth on vomer, palatines, pterygoids and tongue. Gill membranes united at bases, free from isthmus. Gill rakers stout, few, with series of protuberances on inner side of first branchial arch. Branchiostegals 15 or 16. Scales large. Dorsal much shorter than anal. Dorsal and anal separated from caudal. Pectorals elongate.

Several species in the Indo-Malayan region.

ANALYSIS OF SPECIES

a^1. DELSMANIA. Scales 21 to 24 in lateral line, 2 or 3 above; pectoral 3 in combined head and body to caudal base ---------- formosus

a^2. SCLEROPAGES. Scales 34 to 39 in lateral line, 3 to 5 above; pectoral 3½ to 4¼ in combined head and body to caudal base.

  b^1. Scales 3 or 4 above lateral lines; D. 20; A. 31; pectoral 4¼ in combined head and body to caudal base ---------- leichardti

  b^2. Scales 4 or 5 above lateral line; D. 16 to 19; A. 27 to 29; pectoral 3¼ in combined head and body to caudal base ---------- guntheri

Subgenus DELSMANIA Fowler

Scales 21 to 24 in lateral line, 2 or 3 above. Pectoral 3 in combined head and body to caudal base.

SCLEROPAGES FORMOSUS (Schlegel and Müller)

Osteoglossum formosum SCHLEGEL and MÜLLER, Verh. Nat. Ges. Nederland. Zool., p. 1, pl. 1, 1829–41 (type locality: Borneo).—VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 225, 1846 (copied).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 145, pl. (18) 276, fig. 2, 1866–72 (Sumatra, Banka, Borneo).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 378, 1870 (Borneo).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, pp. 304, 312, 404, 1876 (Danau, Sriang, Borneo).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 623, 1926 (Ludu, Borneo).

Scleropages formosus WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 13, fig. 7, 1913 (Palembang, Sumatra, Borneo).—H. M. SMITH, Copeia, 1931, p. 64 (Kratt).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 243, 1934 (reference); vol. 86, p. 335, 1934 (Kratt).—HARDENBERG, Treubia, vol. 14, livr. 3, p. 304, 1934 (Pulu Perdamaran, Rokan River mouth, Sumatra); vol. 15, livr. 3, p. 226, 1936 (Sungei Terentang, middle course Kapuas R., Borneo).—SUVATTI, Index Fish. Siam, p. 75, 1937 (Trat; Maenam Trat).—FOWLER, List Fish. Malaya, pp. 22, 246, 1938 (reference).

Depth 3½ nearly to 5; head 3½ to 4. Snout 4¾ in head; eye 4 to 4½, subequal with snout, 1½ in interorbital; maxillary reaches beyond eye, 1¾ in head; chin prominent, with 2 stout fleshy barbels, little shorter or longer than eye; interorbital rather low. Gill rakers 8, stout, ¼ shorter than gill filaments or ⅔ of eye.

Scales 21 to 24 in lateral line, of which last 1 or 2 on caudal base; 2 or 3 above, 3 below, about 21 predorsal. Scales large, with prominent, reticulated striae.

D. 20, origin over middle of anal base, height of fin 2⅔ in head; A. 26 or 27, height of fin 2⅖; caudal 1¾, hind edge convex; least depth of caudal peduncle 3⅗; pectoral 2⅞ in combined head and body to caudal base; ventral 1¾ in head.

Above dark olivaceous-green, sides and ventral surface silvery or golden green, sometimes with longitudinal rows of oblique dark patches, shining through lateral scales. Fin membranes bluish, rays reddish brown. Length, 430 mm. (Weber and Beaufort.)

East Indies. Buccal incubation has been noticed by Fuhrmann (1905).

Subgenus SCLEROPAGES Günther

Scales 34 to 39 in lateral line, 3 to 5 above. Pectoral 3½ to 4¼ in combined head and body to caudal base.

SCLEROPAGES LEICHARDTI Günther

Scleropages leichardti GÜNTHER, Ann. Mag. Nat. Hist., ser. 3, vol. 14, p. 196, pl. 7, 1864 (type locality: Burdekin Rilver and Princhester, 90 miles from Rockhampton, Queensland).—KENT, Proc. Roy. Soc. Queensland, vol. 8, pt. 2, p. 108, 1892 (eastern coastline of Queensland).—WEBER, Notes Leyden Mus., vol. 32, p. 226, pl. 3, 1910 (Digul River, Dutch New Guinea); Nova Guinea, vol. 9, p. 516, 1913 (copied).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 14, 1913 (copied).—FOWLER, Mem. Bishop Mus., vol. 10, p. 33, 1928 (compiled).—MCCULLOCH, Austral. Mus. Mem., vol. 5, p. 36, 1929 (Queensland).

Scleropages leichardtii BANCROFT, Proc. Roy. Soc. Queensland, vol. 28, p. 93, 1916 (Dawson River).

Scleropages leichhardti MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).

Osteoglossum leichardti GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 378, 1868 (type).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 256, 1881 (Queensland Rivers).—KENT, Great Barrier Reef, p. 299, 1893 (Fitzroy, Dawson, and other intertropical Queensland rivers).

Osteoglossum jardinii KENT, Proc. Roy. Soc. Queensland, vol. 8, No. 3, p. 105, 1892 (type locality: Batavia and Gregory Rivers, Cape York, Gulf of Carpentaria, Queensland).

Osteoglossum jardinei KENT, Great Barrier Reef, p. 300, 1893 (Batavia, Norman and Gregory Rivers).

Scleropages jardinii BANCROFT, Proc. Roy. Soc. Queensland, vol. 28, p. 95, 1916 (Gregory River).

Scleropages jardinei MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).

Depth 3¾; head 3¼. Snout 7⅖ in head from snout tip; eye 7⅕, subequal with snout; maxillary reaches well beyond eye, length 1⅞ in head from upper jaw tip; lower jaw protudes, with pair of very small barbels near symphysis; series of small, close-set, conic teeth in each jaw and band of coarse cardiform teeth runs round palate; interorbital 3¾ in head; broad suborbitals finely striate like opercle.

Scales 33 in lateral line to caudal base and 2 more on latter; 4 above, 5 below, about 28 predorsal. Scales very large, higher than long, minutely granulated; finely reticulate around larger median mesh.

D. 20, inserted slightly before middle of anal base, ninth ray 3 in total head length; A. 31, base nearly long as head, third ray 3⅖; caudal 2⅛, convex behind; ventral 3½; pectoral 1¼, not quite reaching ventral, 4⅕ in combined head and body to caudal base.

Entire body finely dotted with brown. Vertical fins and opercular membrane with small whitish spots. Length 712 mm. (Günther.)

Queensland.

SCLEROPAGES GUNTHERI (Castelnau)

FIGURE 13

Osteoglossum guntheri CASTELNAU, Journ. Zool., Gervais, vol. 5, p. 131, 1876 (type locality: Northeast Australia).

Scleropages guntheri FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 220 (labeled "New Zealand" though doubtless from Queensland).

Scleropages guentheri MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—MCCULLOCH, Austral. Mus., Mem., vol. 5, p. 36, 1929 (Queensland).

Osteoglossum leichardti (not Günther) KENT, Proc. Roy. Soc. Queensland, vol. 8, pt. 2, p. 108, 1892 (part).

Depth 3⅞ to 4⅘; head to hind opercle edge 3⅞ to 4⅘, width 2⅕ to 2⅓. Snout 4¼ to 5 in head from snout tip; eye 5⅕ to 6⅕, 1⅓ in snout, 1¾ in interorbital; maxillary reaches ⅞ in eye, expansion 2 in eye, length 1¾ to 1⅞ in head from snout tip; continuous series of strong moderate-sized jaw teeth, laterally more or less concealed by tough thick lips; at snout tip 2 enlarged teeth, also each side little below or opposite nostrils 2 or 3 others; each side of mandibular symphysis 3 enlarged strong teeth and none more than twice size of others; vomer anteriorly with 3 transverse strong teeth, 5 smaller each side, also long area of small strong palatine teeth besides broad asperous pterygoid area; interorbital 3⅗ to 3⅞, broadly convex, depressed. Gill rakers 8+13, pointed, rather robust, 1¾ in eye.

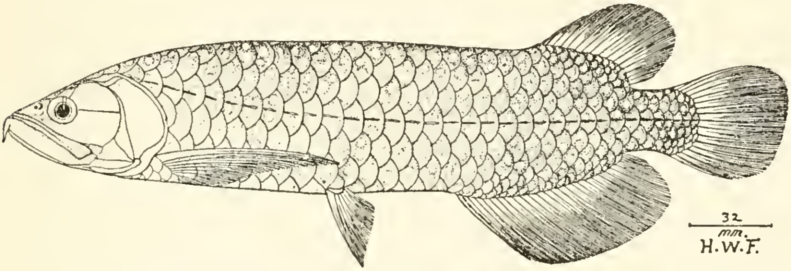

FIGURE 13.—*Scleropages guntheri* (Castelnau): Specimen from Queensland.

Scales 30 to 34 in lateral line to caudal base and 3 or 4 more on latter; 4 or 5 scales above lateral line, 4 to 6 below, 21 to 26 predorsal; exposures reticulated pattern on mosaic-like surface. Along anal base scales extend out from body and ensheath bases of fin rays; caudal base scaly. Tubes short, simple, horizontal, median on scale exposures.

D. 16 to 19, twelfth ray 1⅘ in total head length; A. 27 to 29, sixth ray 1⅔; caudal 1¼; least depth of caudal peduncle 2⅞; ventral 1⅞; pectoral 3½ in combined head and body to caudal base.

Largely dull brown, paler below and with leaden gray sheen. Each scale with 1 or 2 yellowish spots. Top of head brownish dusky, sides largely with silvery sheen. Fins dull brownish, membranes of dorsal, anal, and caudal mostly dusky.

Queensland.

13 examples. A.N.S.P. Queensland (wrongly labeled "New Zealand"). Dr. J. Haast. Length, 292–591 mm.

Family CHANIDAE

Body oblong, compressed. Abdomen broad, rounded or flattened. Snout depressed. Eye completely covered with broad adipose lids. Mouth small, lower jaw with small symphyseal tubercle. Maxillary short, wide, excluded from mouth gape, without supplemental bone. Mandible overlapped by upper jaw. No teeth. Gill membranes broadly united, free from isthmus. Pseudobranchiae moderate and accessory branchial organ in cavity behind gill cavity. Branchiostegals 4, wide. Mucous membrane of oesophagus raised in spiral fold. Air bladder large. Intestine with many convolutions. Vertebrae 45. Scales small, firm, adherent, cycloid. Lateral line complete, tubes simple. Dorsal opposite ventral. Anal shorter than dorsal. Caudal long and deeply forked. Pectorals low. Ventral rays 10 to 12.

Large fishes of the Indo-Pacific. One living genus, besides several as fossils from European Cretaceous and Eocene deposits.

Genus CHANOS Lacépède

Chanos Lacépède, Hist. Nat. Poiss., vol. 5, p. 395, 1803. (Type, *Chanos arabicus* Lacépède, monotypic.)

Lutodeira Van Hasselt, Algemein Konst. Letterbode, p. 333, May 1823. (Type, *Lutodeira indica* Van Hasselt, monotypic).—Van Hasselt, Bull. Sci. Nat. Férussac, vol. 2, p. 92, 1824. (Type, *Lutodeira indica* Van Hasselt.)

Lutodira Agassiz, Nomencl. Zool. Index Univ., p. 217, 1846. (Type, *Lutodeira indica* Van Hasselt.)

Scoliostomus Rüppell, Atlas Reise Nördl. Afrika, Fische, p. 17, 1828. (Type, *Lutodeira indica* Van Hasselt.)

Ptycholepis (not Agassiz 1832) Gray, in Dieffenbach, Travels in New Zealand, vol. 2, p. 218, 1842. (Type, *Mugil salmoneus* (Forster) Schneider.)

Body fusiform. Belly not keeled. Head depressed. Eye large. Mouth terminal, transverse. Upper edge of upper jaw formed by premaxillaries, with which front end of maxillary firmly joined. Gill rakers very fine and numerous. Scales silvery, rows arranged longitudinally. Head naked. Dorsal and anal with basal scaly sheaths. Lateral line with simple tubes. Caudal forked, long. Pectoral low. Ventral rays 10 to 12.

One species.

CHANOS CHANOS (Forskål)

Mugil chanos Forskål, Descript. Animal., pp. xiv, 74, 1775 (type locality: Djedda, Red Sea).—Bonnaterre, Tableau encyclop. Ichth., p. 180, 1788 (Red Sea).—Gmelin, Syst. Nat. Linn., vol. 1, p. 1398, 1789 (Red Sea).—Walbaum, Artedi Pisc., vol. 3, p. 22, 1792 (copied).—Schneider, Syst. Ichth. Bloch, p. 116, 1801 (Red Sea).

Lutodeira chanos Rüppell, Atlas Reise Nördl. Afrika, Fische, p. 18, pl. 5, figs. 1–2, 1828 (Red Sea); Neue Wirbelth., Fische, pp. 80, 84, 1835 (note).—Günther, Fishes of Zanzibar, p. 120, 1866 (Kiswarra Bay; Seychelles).

Lutodera chanos Martens, Verh. zool. bot. Ges. Wien, vol. 16, p. 379, 1866 (Gebel Fernjeh, Red Sea).

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Chanos cyprinella EYDOUX and SOULEYET, Voy. *Bonite*, Zool., vol. 1, p. 196, 1841 (type locality: Hawaiian Islands).—VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 198, 1846 (Honolulu).

Chanos oriental EYDOUX and SOULEYET, Voy. *Bonite*, Zool., vol. 1, p. 196, pl. 7, fig. 1, 1841 (type locality: Hawaiian Islands). (Name in synonymy.)

Chanos orientalis VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 197, 1846 (no locality).—SCHMELTZ, Cat. Mus. Godeffroy, No. 1, p. 10, 1864 (South Seas).—KNER, Reise *Novara*, Fische, p. 341, 1865 (Java).—STEINDACHNER, Sitz. Ber. Akad. Wis. Wien, math-nat. Kl., vol. 56, p. 320, 1867 (Cape York).—SCHMELTZ, Cat. Mus. Godeffroy, No. 4, p. 25, 1869 (Viti Islands).

Chanos mento VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 194, 1846 (type locality: Mauritius).

Chanos chloropterus VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 195, 1846 (type locality: Madeoplan, India).—KNER, Reise *Novara*, Fische, p. 341, 1865 (Java and Tahiti).

Lutodeira chloropterus PLAYFAIR, Proc. Zool. Soc. London, 1868, p. 868.

Chanos nuchalis VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 196, 1846 (on *Palah bontah* Russell).

Chanos lubina VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 199, pl. 567, 1846 (type locality: Buru, Seychelles, Mauritius).—GUICHENOT, Notes ile Réunion, vol. 2, p. 29, 1863.—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 82, 1866–72 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 474, 1868 (compiled).

Buterinus maderaspatensis JERDON, Madras Journ. Lit. Sci., vol. 15, p. 344, 1849 (type locality: Madras).

Chanos mossambicus PETERS, Monatsb. Akad. Wiss. Berlin, p. 684, 1852 (type locality: Mozambique).—MARTENS, *in* von der Decken's Reise Ost Afrika, vol. 3, pt. 1, p. 144, 1869 (Kisanga).

Lutodira mossambica PETERS, Arch. Naturg., 1855, p. 268 (Mozambique).

Chanos gardineri REGAN, Fauna Geogr. Maldive and Laccadive Archi., Gardner, vol. 1, p. 280, 1903 (type locality: North Pool of Hulule Island, Male Atoll).

Depth 3½ to 4¾; head 3¼ to 4½, width 1⅘ to 2⅛. Snout 3⅕ to 4 in head; eye 3½ to 7, greater than snout, 1¼ to 1⅖ in interorbital, covered with large adipose lids; maxillary not quite reaching eye, length 4 to 4¼ in head; interorbital 2⅖ to 3⅛, low or only slightly convex. Gill rakers 147 to 160+107 to 165, fine, extremely slender, 2½ to 3 in gill filaments.

Scales 78 to 80 in lateral line to caudal base and 8 to 11 more on latter; 12 or 13 scales above, 9 to 11 below, 30 to 46 predorsal. Scales with 31 to 51 horizontal parallel striae, ending in slender points; basal notch well developed, with rather coarse circuli 12 to 15 or fine.

D. IV to VI, 9, I to 12, I, fourth to sixth ray 1¼ to 1⅖ in total head length; A. III, 6, I to 8, I, third simple ray 3⅛ to 3¾; least depth of caudal peduncle 2½ to 3; pectoral 1⅖ to 1⅔; ventral 1¾ to 2⅛; caudal 2¾ to 3⅛ in rest of body.

Dull olive-brown, paler to whitish brown. Sides and under surfaces bright silvery white. Dorsal and caudal pale brownish to grayish, also pectoral above, fins otherwise whitish.

Red Sea, Arabia, Zanzibar, Mozambique, Natal, Mauritius, Rodriguez, Seychelles, Chagos Archipelago, Maldives, Laccadives, India, Ceylon, Malay Peninsula, Pinang, East Indies, Philippines, China, Formosa, Japan, West Australia, Northern Territory, Queensland, New South Wales, Norfolk Island, New Zealand, Melanesia, Polynesia, Hawaii. In life the coloration is dark gray, greenish or neutral above, silvery white below and dorsal, caudal and anal fins dusky terminally.

18369, 18370. Caloocan, Manila, Luzon. August 12, 1908. Length, 89–189 mm.

19485 to 19488. Port Matalvi, Luzon. November 23, 1908. Length, 133–186 mm.

2 examples. Nabatas, Luzon—fish ponds and Malabon River, from Malabon. July 12, 1908. Length, 75–88 mm.

7 examples. Bangao plant in Palatikin 100 x 120. May 29, 1905. Caught August 8, 1908. Length, 64–83 mm.

U.S.N.M. No. 20861. Hawaiian Islands. B. B. Redding. (Introduced in California.) 3 examples.

U.S.N.M. No. 30601. New Guinea. Australian Museum. Length, 163 mm.

U.S.N.M. No. 30612. New Guinea. Australian Museum. Length, 156 mm.

U.S.N.M. No. 49282. Red Sea. Milan Museum. Length, 315 mm.

U.S.N.M. No. 51066. Hawaiian Islands. U. S. Fish Commission (04013, 03177). Length, 215–280 mm. 2 examples.

U.S.N.M. No. 52349. Samoa. Bureau of Fisheries. Length, 331 mm.

U.S.N.M. No. 55551. Hawaiian Islands. Bureau of Fisheries. Length, 303–305 mm. 2 examples.

U.S.N.M. No. 55602. Manila. Dr. E. A. Mearns. Length, 145 mm.

U.S.N.M. No. 56334. Cavite, Luzon. G. A. Lung. Length, 277 mm.

U.S.N.M. No. 58039. Zamboanga. Dr. E. A. Mearns. Length, 310–315 mm. 2 examples.

U.S.N.M. No. 61667. Honolulu. C. L. Berndt. Length, 225 mm., deformed example with body abnormally short. Depth 2⅕.

U.S.N.M. No. 65798. Niau Island, Paumotus. *Albatross* collection. July 16, 1890. Length, 240 mm., caudal tips broken. Back with steel blue or blue-green reflections, under surface whitish.

U.S.N.M. No. 65799. Makemo, Paumotus. *Albatross* collection. Length, 210 mm. 2 examples. Back with blue-green reflections, otherwise largely silvery white.

U.S.N.M. No. 72273. Manila market. R. C. McGregor. Length, 310 mm.

U.S.N.M. No. 72492. Batavia, Java. 1909. Bryant and Palmer. Length, 303 mm.

U.S.N.M. No. 72493. Batavia, Java. Bryant and Palmer. Length, 220 mm., caudal tips broken.

U.S.N.M. No. 82799. Fiji. U. S. Exploring Expedition. Length, 120 mm.,

U.S.N.M. No. 82895. Oahu. U. S. Exploring Expedition. Length, 160 mm.

U.S.N.M. No. 83443. No locality. U. S. Exploring Expedition. Head, 45 mm. long.

Family PTEROTHRISSIDAE

Body oblong, elongate, belly rounded. Head narrow, oblong. Eye large. Mouth narrow, upper jaw edge formed by premaxillaries mesially and maxillaries laterally. Teeth minute, imbedded in thick lips. Opercular apparatus complete. Gill openings wide. Pseudobranchiae present. Stomach with blind sac. Pyloric coeca numerous. Air bladder with thick walls, ends in 2 short horns in front, pointed behind. Head naked. Lateral line present. Dorsal long, with numerous rays, little higher in front. Anal very small, posterior. Caudal forked. Pectoral low.

One living genus, also as fossil *Istieus* Agassiz from the Cretaceous of Europe and Syria.

Genus PTEROTHRISSUS Hilgendorf

Pterothrissus Hilgendorf, Act. Soc. Leopoldina Carol., pt. 13, p. 127, 1877. (Type, *Pterothrissus gissu* Hilgendorf, monotypic.)

Bathythrissa Günther, Ann. Mag. Nat. Hist., ser. 4, vol. 20, p. 443, 1877. (Type, *Bathythrissa dorsalis* Günther, monotypic.)

Body rather slender, tapers gradually back from front of dorsal to small slender caudal peduncle. Head large, with well-developed mucous cavities on cheek. Snout long, conic, end blunt, projects beyond mouth, with median ridge above. Eye median, high. Mouth small, subterminally inferior. Maxillary with marginal row of very small teeth. Orbital ridges project above sides of interorbital space. Gill membranes united. Gill rakers short, stout, papillate or tuberculate. Scales small, cycloid, deciduous. Caudal finely scaly over greater portion from base. Pyloric coeca 14. Vent near last fifth of body without caudal. Dorsal length half of body without caudal. Pectorals longer than ventrals, latter less than half of head and inserted midway between gill opening and anal origin.

One species.

PTEROTHRISSUS GISSU Hilgendorf

Pterothrissus gissu HILGENDORF, Act. Soc. Leopolidina Carol., pt. 13, p. 127, 1877 (type locality: off Tokyo).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 349 (Tokyo), p. 743, 1900 (Hakodate).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 52, 1901 (reference).—JORDAN and STARKS, Bull. U. S. Fish Comm., vol. 22, p. 578, 1902 (Matsushima and Suruga Bay).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 618, 1906 (Suruga Bay, Matsushima Bay, Tsuruga Straits, Hakodate).—FRANZ, Abh. Bayer. Akad. Wiss., vol. 4, suppl. vol. 1, p. 4, 1910 (Aburatsubo).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Tokyo market).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 119, 1925 (Shizuka and Yokohama markets).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 17, 1931 (Tokyo).—TANAKA, Jap. Fish. Life Colours, No. 40, 1933.

Bathythrissa dorsalis GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 20, p. 443, 1877 (type locality: off Inosima, Japan); Rep. Voy. *Challenger*, vol. 22, p. 222, pl. 56, fig. A, 1887 (type, from 345 fathoms depth).

Depth 5 to 7½; head 3½ to 4, width 2 to 3⅖. Snout 2¾ to 3 in head; eye 3 to 4⅛, 1 to 1⅗ in snout, greater than interorbital; maxillary reaches ⅗ to ⅘ to eye, expansion 2 to 2¾ in eye, length 3¼ to 4¾ in head; teeth fine, conic, short, in rather broad bands in jaws; palate edentulous; interorbital 4¾ to 5⅞, low, medianly depressed. Gill rakers 3+11, short, spinescent tubercles, ⅓ of gill filaments which ½ in eye.

Scales 100 to 104 in lateral line to caudal base and 9 or 10 more on latter; 8 or 9 above, 6 or 7 below, 20 to 22 predorsal. Scales with 7 basal radiating striae; circuli fine, none apical.

D. III to V, 51, I to 53, I, first branched ray 2 1/10 to 2⅗ in head; A. III, 9, I, first branched ray 2¾ to 3⅞; caudal 1 2/7 to 1⅔, deeply forked, lobes broad; least depth of caudal peduncle 4 to 4⅛; pectoral 1⅔ to 1¾; ventral 2⅛ to 2½.

Brownish above, below silvery minutely dotted with brown. Alcoholic specimens only paler below as scales have fallen.

Coasts of Japan, in deep water. Günther's fish was only 384 mm. in length.

U.S.N.M. No. 51414. Matsushima, Japan. *Albatross* collection. Length, 74–95 mm. 5 examples.

U.S.N.M. No. 51449. Matsushima, Japan. *Albatross* collection. June 5, 1900. Length, 175–249 mm. 4 examples.

U.S.N.M. No. 57548. Tsushima, Japan. P. L. Jouy. Length, 366 mm.

U.S.N.M. No. 61664. Tokyo. Bureau of Fisheries (2353). Length, 490 mm.

U.S.N.M. No. 71378. Tokyo market. Bureau of Fisheries. Length, 473 mm.

Family NOTOPTERIDAE

Body greatly compressed, caudal region very long, tapering. Head compressed. Upper jaw edge formed by premaxillaries and maxillaries, latter more developed. Parietals separate supraoccipital from frontal bones. Large hole on each side of skull between squamosal, exoccipital, and epiotic. No subopercle. Interopercle small, hidden under preopercle. No barbels. No pseudobranchiae or pharyngeal teeth. Air bladder divided in interior, communicates with ear. Stomach without blind sac. Pyloric coeca 2. No oviducts. Ribs sessile, accessory bones (adpleurals) attached to ends of front ribs or even fused, embraced by double ventral serratures. Precaudal vertebrae with transverse processes before ribs. Head and body densely scaled. Dorsal short, when present on caudal part of vertebral column. Anal very long. Pectoral depressed against sides.

Two genera, living in fresh or brackish water, chiefly in swamps or lagoons of southeast Asia and tropical Africa. The fishes of this family may be readily known by the extraordinarily long based anal, usually confluent with the small caudal fin.

Genus NOTOPTERUS Lacépède

Notopterus Lacépède, Hist. Nat. Poiss., vol. 2, p. 189, 1800. (Type, *Notopterus kapirat* Lacépède=*Gymnotus notopterus* Pallas, virtually tautotypic.)

Chitala Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 244, 1934. (Type, *Mystus chitala* Buchanan-Hamilton, orthotypic.)

Body elongated, strongly compressed. Snout obtuse, convex. Mouth large or moderate, cleft lateral. Small teeth on premaxillaries, maxillaries, vomer, palatines, pterygoids, and tongue. Front nostril with tentacle, hind one near eye. Bones of head cavernous, lower preopercle edge serrated. Gill membranes partly united. Branchiostegals 6 to 9.

ANALYSIS OF SPECIES

a^1. Chitala. Opercular scales not larger than those on body; 12 to 22 transverse rows of scales on preopercle; 37 to 45 pairs of abdominal scutes.
  b^1. Maxillary reaches far behind eye; 20 to 22 transverse rows of scales on preopercle ---------- chitala
  b^2. Maxillary reaches hind border of eye or little beyond; 12 to 16 transverse rows of scales on preopercle ---------- borneensis
a^2. Notopterus. Opercular scales much larger than those on body; 8 to 10 transverse rows of scales on preopercle; 28 to 33 pairs of abdominal scutes; maxillary reaches hind pupil or eye edge ---------- notopterus

Subgenus Chitala Fowler

Opercular scales not larger than those on body. Preopercle with 10 to 22 transverse rows of scales. Abdominal scutes 37 to 45.

NOTOPTERUS CHITALA (Buchanan-Hamilton)

Mystus chitala Buchanan-Hamilton, Fishes of Ganges, pp. 236, 382, 1822 (type locality: Bengal and Behar Rivers).—Gray, Illustr. Indian Zool., Hardwicke, vol. 1, pl. 91, fig. 1, 1832 (plate missing in Academy copy).

Notopterus chitala Gray, Zool. Misc., p. 16, 1831 (Indian Seas).—Bleeker, Verslag. Kon. Akad. Wet. Amsterdam, vol. 16, p. 356, 1864 (Siam); Nederland. Tijdschr. Dierk., vol. 2, p. 176, 1865; Atlas Ichth. Ind. Néerland., vol. 6, p. 147, pl. (16)274, fig. 2, pl. (17)275, fig. 2, 1866–72 (Java, Sumatra, Borneo, Bengal).—Günther, Cat. Fishes British Mus., vol. 7, p. 479, 1868 (East India, Siam, types of *Notopterus lopis* and *Notopterus hypselonotus*).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 405, 1876 (Sintang in Borneo).—Day, Fishes of India, pt. 4, p. 654, pl. 159, fig. 5, 1878 (Sind, Lower Bengal, Orissa, Assam, Burma, Siam).—Duncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 187, 1904 (Kuala Lipis).—Popta, Notes Leyden Mus., vol. 27, p. 209, 1906 (Upper Mahakam, Borneo).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (without locality).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 10, fig. 6, 1913 (Sahilan, Djambi, Nias, Djonkong).—Hora, Journ. Nat. Hist. Soc. Siam, vol. 6, No. 2, p. 175, 1923 (Nontaburi).—Vipulya, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 227, 1923 (Bangkok).—Chabanaud, Service Océanogr. Pêches Indo-Chine, 1^e Note, p. 7, 1926 (Cambodia; Cochinchina).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^e Note, p. 124, 1929 (Cochinchina).—Borodin, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (Saigon).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 90, 1935 (Bangkok; Paknam).—Hardenberg, Treubia, vol. 15, livr. 3, p. 226, 1936 (Pontianak; middle course of Kapuas R., Borneo).—Suvatti, Index Fish. Siam, p. 18, 1937 (Bung Baraphet; Samrong Canal; Ban Pho; Suphanburi River).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 14, 1937 (Chandra Dam, Perak).—Fowler, List Fish. Malaya, p. 23, 1938 (reference).

Notopterus ornatus Gray, Zool. Misc., p. 16, 1831 (type locality: Indian Seas).

Notopterus maculatus Valenciennes, Voy. Ind. Orient. Belanger, Zool., p. 396, pl. 5, fig. 2, 1834 (type locality: India).

Notopterus buchanani Valenciennes, Hist. Nat. Poiss., vol. 21, p. 108, 1848 (type locality: Calcutta, Bengal).

Notopterus lopis Bleeker, Nat. Geneesk. Arch. Neder].-Indië, vol. 2, p. 510, 1845 (type locality: Batavia); Atlas Ichth. Ind. Néerland., vol. 6, pl. (17) 275, fig. 2, 1866–72.

Notopterus hypselonotus Bleeker, Verh. Batav. Genootsch. (Chiroc.), vol. 24, p. 27, 1852 (type locality: Mussi River, Palembang, Sumatra).—Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, pl. (16) 274, fig. 2, 1866–72.

Depth 4; head 4⅘. Snout 7 in head; eye 7⅘, trifle before first fifth in head, slightly less than snout; maxillary reaches well behind eye, expansion 1⅖ in eye, length 2⅗ in head; teeth uniserial, along front of each jaw edge; row of palatine teeth, little enlarged in front; interorbital 9⅔, little convex; lower preopercle edge minutely serrate.

Scales about 135 ? tubular (damaged) in lateral line; scales about 200 in lateral line to caudal base and 10 more on latter; 21 above, 37 below, about 165 predorsal scales. Scales cycloid, crowded and smaller along body edges, very minute and numerous over most all of anal and caudal. Cheek with 16 series of scales over greatest extent. Ventral scutes about 50.

D. II, 5, I, origin more than eye diameter nearer caudal base than hind eye edge, length 2⅓ in head; caudal little less than greatest anal depth; A. V, 122 (not including lower undefined half of caudal) and upper lobe contains about 7 more; pectoral II, 12, small (damaged); rudimentary ventral close before anal.

Brown, with silver-gray tint, mostly uniform, immaculate; fins pale.

India, Burma, Siam, Java, Sumatra, Nias, Borneo.

1 example. A.N.S.P. No locality. Dried skin, 450 mm.

NOTOPTERUS BORNEENSIS Bleeker

Notopterus borneensis BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 2, p. (417) 437, 1851 (type locality: Sambas, West Borneo).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 479, 1868 (type; type of *Notopterus maculosus*).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 147, pl. (17) 275, fig. 1, 1866–72 (Sumatra and Borneo).—VOLZ, Zool. Jahrb., abth. syst., vol. 19, p. 410, 1904 (Benakat, Sumatra).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 489 (Baram, Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 11, 1913 (compiled).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 624, 1926 (Lundu River, Borneo).

Notopterus maculosus BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 2, pp. 417, 438, 1851 (type locality: Sambas, West Borneo).

Depth 3⅔ to 4; head 4¾ to 5. Eye 4⅗ to 5 in head, longer than snout; maxillary reaches hind edge of eye or little beyond, length 2¼ to 2½ in head; lower suborbital edge and lower border and ridge on preopercle slightly serrated. Gill rakers ?

Scales about 75 transversely from anal origin; scales on opercles not larger than on body, 12 to 16 transverse rows on preopercle; double series of 37 to 41 spines along abdomen.

D. 9 or 10; origin about midway between snout and caudal base in young, with age midway between eye and caudal base; A. 112 to 124; pectoral long as or shorter than postorbital part of head, rays 16 or 17; ventral 4 or 5.

Grayish silvery, back darker. Anal and caudal margined with brown. Axil of pectorals sometimes brown. Sides of body, anal and caudal sometimes with smaller or larger brownish spots. Length, 430 mm. (Weber and Beaufort.)

Sumatra, Borneo.

Subgenus NOTOPTERUS Lacépède

Opercular scales much larger than those on body. Preopercle with 8 to 10 transverse rows of scales.

NOTOPTERUS NOTOPTERUS (Pallas)

Gymnotus notopterus Pallas, Spicil. Zool., vol. 7, p. 40, pl. 6, fig. 2, 1769 (type locality: Indian Ocean).—Bonnaterre, Tableau encyclop. Ichth., p. 37, pl. 25, fig. 83, 1788 (seas of Asia).—Gmelin, Syst. Nat. Linn., vol. 1, p. 1139, 1789 (Amboina).—Walbaum, Artedi Pisc., vol. 3, p. 166, 1792 (copied).—Forster, Fauna Indica, p. 14, 1795.

Notopterus notopterus Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 9, 1913 (Batavia, Java).—Hora, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 175, 1923 (Nontaburi).—Vipula, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 226, 1923 (Bangkok).—Hora, Mem. Asiatic Soc. Bengal, vol. 6, p. 482, 1924 (Tale Sap, Inner Lake).—Chabanaud, Service Océanogr. Pêches Indo-Chine, 1^e note, p. 7, 1926 (Cambodia; Cochinchina).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 85, 1934 (Chieng Mai; Bangkok); vol. 87, p. 90, 1935 (Bangkok); vol. 89, p. 130, 1937 (Bangkok; Paknam; Tachin).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 14, 1937 (Lake Chini, Pahang).—Suvatti, Index Fish. Siam, p. 18, 1937 (Ayuthaya; Canthaburi; Khlong Sok; Mae-Nga).—Fowler, List Fish. Malaya, p. 23 (246), 1938 (reference).

Notopterus kapirat Lacépède, Hist. Nat. Poiss., vol. 2, p. 190, 1800 (type locality: Amboina).—Gray, Zool. Misc., p. 16, 1831 (Indian Seas).—Valenciennes, Voy. Ind. Orient. Belanger, Zool., p. 39, pl. 5, fig. 1, 1834 (tanks of Bengal).—Richardson, Ichth. China Japan, p. 309, 1846 (compiled).—Jerdon, Madras Journ. Lit. Sci., vol. 15, p. 343, 1849.—Bleeker, Nova Acta Acad. Caes. Leop. Carol. Naturae Curios, vol. 24, pt. 1, p. 55, pl. 6, 1854; Nederland. Tijdschr. Dierk., vol. 2, pp. 35, 176, 1865 (Siam); Atlas Ichth. Ind. Néerland., vol. 6, p. 146, pl. (18) 276, fig. 1, 1866–72 (Java, Sumatra, Celebes, Bengal).—Günther, Cat. Fish. British Mus., vol. 7, p. 480, 1868 (Madras, Nilgherries, Dekkan, Loodianali, Poonah, Calcutta, Bengal, Assam, Cachar, Siam, East India, East Indies).—Day, Fishes of India, pt. 4, p. 653, pl. 159, fig. 4, 1878 (India).—Károli, Termesz. Füzetek, Budapest, vol. 5, p. 184, 1881 (Siam).—Sauvage, Bull. Soc. Philom. Paris, ser. 7, vol. 7, p. 152, 1883 (Menam).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 9, 1889, p. 355, 1890 (Rangoon, Mandalay, Kokarit).—Weber, Zool. Nederland. Ost Ind., vol. 3, p. 427, 1894 (Batavia).—Duncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 187, 1904 (Kuala Semantan).—Lloyd, Rec. Indian Mus., vol. 1, p. 222, 1907 (Akyab).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 9, 1913 (Batavia).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^e note, pp. 31, 124, 174, 1929 (Thudoumot).—Borodin, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (Saigon).

Mystus kapirat Buchanan-Hamilton, Fishes of Ganges, pp. 235, 382, 1822 (ponds and rivers of fresh water of Bengal).—Gray, Illustr. Indian Zool. Hardwicke, vol. 1, pl. 91, 1832 (plate missing in Academy copy).

Clupea synura Schneider, Syst. Ichth. Bloch, p. 426, 1801 (type locality: Malabar; China).

Mystus badgee Sykes, Trans. Zool. Soc. London, vol. 2, p. 376, pl. 67, fig. 2, 1838 (type locality: Poona, Seedataik).

Notopterus pallasii Valenciennes, Hist. Nat. Poiss., vol. 22, p. 95, 1848 (type locality: India).

Notopterus bontianus Valenciennes, Hist. Nat. Poiss., vol. 22, p. 107, pl. 613, 1848 (type locality: Irrawaddi and Java).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. (76) 151, 1853 (Calcutta).

Depth 3¾ to 3⅘; head without opercular flap 5 to 5⅔. Eye 4¼ to 5 in head, equals snout or slightly longer; maxillary reaches hind pupil or eye edge, according to age, 2¼ to 2½ in head; 2 ventral ridges of mandible and preopercle serrated, also lower border of suborbitals. Gill rakers 8, ¾ of eye, ⅓ shorter than gill filaments.

Scales about 65 transversely at anal origin; 8 to 10 transverse rows on preopercle; much larger on opercles than on body. Double series of 26 to 33 spines along abdomen.

D. 8 or 9, origin midway between snout and end of caudal, high as postorbital part of head; A. 100 to 110; pectoral long as head without snout, rays 15 to 17; ventral 5.

More or less grayish silvery, back darker. Anal and caudal often margined with blackish. Length, 350 mm. (Weber and Beaufort.)

India, Burma, Siam, Java, Sumatra.

Family DOROSOMIDAE

Body short, deep, well compressed. Belly compressed to edge armed with bony serrae. Head short, rather small. Eyes with adipose lids. Mouth small, inferior, oblique, overlaps blunt snout. No teeth. Mandible short, deep, rami enlarged basally. Premaxillaries not protractile. Gill membranes not united, free from isthmus. Pseudobranchiae large. Branchiostegals 6. Stomach short, muscular, like gizzard of fowl. Scales thin, deciduous, cycloid. Head naked. No lateral line. Dorsal median, usually behind ventrals and last ray often prolonged in filament. Anal very long, low. Caudal forked.

Mud-eating fishes of the coasts and rivers of warm regions, many in fresh water. They are usually little valued as food. The gizzard-like stomach seems to be the outstanding character of distinction for the family.

ANALYSIS OF GENERA

- a^1. Dentary edge reflected outward in front of maxillary end; mouth toothless, subterminal or inferior, transverse, its cleft forming angle.
  - b^1. Last dorsal ray not prolonged in filament.
    - c^1. Maxillary slender, terminally slightly expanded and curved downwards. **Gonialosa**
    - c^2. Maxillary straight, thin, transversely expanded plate, tapering terminally. **Anodontostoma**
  - b^2. Last dorsal ray prolonged in filament_____________________ **Nematalosa**
- a^2. Dentary edge not reflected outward in front of maxillary; mouth terminal or subterminal; last dorsal ray prolonged in filament___________ **Clupanodon**

Genus GONIALOSA Regan

Gonialosa REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 315, 1917. (Type, *Chatoessus modestus* Day, designated by Jordan, Genera of fishes, pt. 4, p. 560, 1920.)

Indialosa Herre and Myers, Lingnan Sci. Journ., No. 10, p. 238, 1931. (Type, *Clupanodon manminna* Buchanan-Hamilton, orthotypic.)

Mouth subterminal or inferior, transverse, cleft forming an angle, toothless. Maxillary slender, terminally slightly expanded and curved downward. One supplemental maxillary. Scales 45 to 75 in longitudinal series, 16 to 25 transversely. Vertebrae 44 to 46. Dorsal rays 14 to 17, with basal scaly sheath, last ray not prolonged. Anal rays 22 to 28. Ventrals with 8 rays, below or in advance of dorsal origin.

Rivers of India and Burma. Mouth as in *Nematolosa* but differs in not having last dorsal ray prolonged.

ANALYSIS OF SPECIES

a^1. Depth 2 to 2½; scales 45 to 47 in lateral series________________ modesta
a^2. Depth 2⅗ to 3⅕; scales 55 to 65 in lateral series_____________ manminna

GONIALOSA MODESTA (Day)

Chatoessus modestus Day, Proc. Zool. Soc. London, 1869, p. 622 (type locality: Bassein River high as Een-gay-gyee Lake, Burma); Fishes of India, pt. 4, p. 633, pl. 160, fig. 1, 1878 (Een-gay-gyee Lake and Moulmein); Fauna British India, Fishes, vol. 2, p. 386, 1889.

Gonialosa modesta Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 315, 1917 (Burma).

Depth 2 to 2½; head 3½ to 4. Snout shorter than eye, which 3 to 3⅓ in head; maxillary reaches front eye edge.

Scales 45 to 47 in medial lateral series; 16 to 18 transversely. Ventral scutes 17 to 19+9 to 12.

D. 14 to 17; A. 24 to 28; ventrals below or in advance of dorsal origin.

Usually a dark humeral spot. Length to 100 mm. (Regan.)

Burma.

GONIALOSA MANMINNA (Buchanan-Hamilton)

Clupanodon manminna Buchanan-Hamilton, Fishes of Ganges, pp. 247, 249, 383, 1822 (type locality: Fresh-water branches of Ganges).

Chatoessus manmina Valenciennes, Hist. Nat. Poiss., vol. 21, p. 114, 1848 (compiled).

Chatoessus manminna Day, Fishes of India, pt. 4, p. 633, pl. 160, fig. 2, 1878 (Sind, Ganges, Jumna, Brahmaputra, Mahannadi, Assam); Fauna Brit. India, Fishes, vol. 1, p. 386, 1889.

Gonialosa manmina Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 315, 1917 (North India and Assam).

? *Clupanodon cortius* Buchanan-Hamilton, Fishes of Ganges, pp. 249, 383, 1822 (type locality: The Brahmaputra near Goyalpara).

Chatoessus cortius Valenciennes, Hist. Nat. Poiss., vol. 21, p. 115, 1848 (copied).—Günther, Cat. Fish. British Mus., vol. 7, p. 410, 1868 (Bengal; Cachar).

Depth 2⅗ to 3⅕; head 3¾ to 4¼. Snout shorter than eye, which 3 to 3½ in head; maxillary not or barely reaching eye.

Scales 55 to 65 in medial lateral series; 21 to 25 transversely. Ventral scutes 16 to 19+10 to 13.

D. 14 to 17; A. 22 to 26; ventrals below or in advance of dorsal. Sometimes a dark humeral spot. Length to 130 mm. (Regan.)

India.

Genus ANODONTOSTOMA Bleeker

Anodontostoma BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 15, 1849. (Type, *Anodontostoma hasseltii* Bleeker=*Clupanodon chacunda* Buchanan-Hamilton, monotypic.)

Maxillary straight, thin, transversely expanded plate, tapering terminally and supplemental maxillary very slender. Vertebrae 42. Scales 40 or 42 in lateral series, 12 to 17 transversely. Dorsal rays 17 to 19, with broad basal scaly sheath extending to end of last ray, which not prolonged. Anal rays 18 to 21, depressible in scaly sheath. Ventral rays 8, fin below middle or front half of dorsal.

Coasts and rivers of India and Indo-Australian Archipelago.

ANALYSIS OF SPECIES

a^1. Snout little protruded; scales 19 transversely; D. 15____________ chanpole

a^2. Snout well protruded; scales 12 or 13 transversely; D. 17 or 18____ chacunda

ANODONTOSTOMA CHANPOLE (Buchanan-Hamilton)

Clupanodon chanpole BUCHANAN-HAMILTON, Fishes of Ganges, pp. 249, 383, pl. 18, fig. 74, 1822 (type locality: Ponds and ditches of every part of Bengal).

Clupanodon champole CUVIER, Règne Animal, ed. 2, vol. 2, p. 320, 1829 (on Buchanan-Hamilton).

Chatoessus chanpole VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 111, 1848 (copied).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 410, 1868 (no locality).

Depth 2½; head little over 4. Snout not much projecting beyond mouth, which nearly transverse.

Scales 46 in medial lateral series; 19 transversely.

D. 15, origin nearer snout end than caudal base, scarcely before ventral bases; A. 21.

Blackish spot on shoulder, followed by several other similar but smaller spots. Length, 153 mm. (Günther.)

Bengal.

ANODONTOSTOMA CHACUNDA (Buchanan-Hamilton)

Clupanodon chacunda BUCHANAN-HAMILTON, Fishes of Ganges, pp. 246, 283, 1822 (type locality: Gangetic estuaries).

Chatoessus chacunda VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 111, 1848 (Molucca Sea; Malacca).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1293, 1849 (Pinang and Malay Peninsula).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.—KNER, Reise *Novara*, Fische, p. 337, 1865 (Java).—DAY, Fishes of Malabar, p. 242, 1865.—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 411, 1868 (Cochin, Ganges, Siam, Borneo, Pinang, Sumatra, East Indies, type of *Chatoessus selangkat*).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1,

p. 404, 1876 (Malabar).—Day, Fishes of India, pt. 4, p. 632, pl. 160, fig. 3, 1878 (India, Burma, Andamans).—Macleay, Proc. Linn. Soc. New South Wales, vol. 7, p. 593, 1883 (New Guinea).—Day, Fauna British India, Fishes, vol. 1, p. 386, 1889.—Weber, Zool. Nederland. Ost Ind., vol. 3, p. 427, 1894 (Batavia).—Elera, Cat. Fauna Filip., vol. 1, p. 582, 1895 (Luzon, Manila).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).

Dorosoma chacunda Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 143, pl. (3)261, figs. 5–6, 1866–72 (Java, Madura, Bali, Sumatra, Pinang, Singapore, Bintang, Banka, Borneo, Celebes, Halmaheira, Amboina).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 616, 1926 (Sarawak).—Tirant, Service Océanogr., Pêches Indo-Chine, 6^e note, pp. 116, 174, 1929 (Cochin China).—Hardenberg, Treubia, vol. 13, livr. 1, p. 100, 1931 (Bagan Si Api Api); vol. 15, livr. 3, p. 227, 1936 (Padang, Tikarbay; Telok Pekadai; Sungei, Terentang; Sungei, Kakap, Borneo).

Anodontostoma chacunda Jordan and Seale, Proc. U. S. Nat. Mus., vol. 28, p. 771, 1905 (Negros).—Smith and Seale, Proc. Biol. Soc. Washington, vol. 19, p. 74, 1906 (Mindanao).—Jordan and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 5, 1907 (Cavite).—Evermann and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 54, 1907 (Bacon).—Jordan and Richardson, Bull. Bur. Fisher., vol. 27 (1907), p. 236, 1908 (Manila: Iloilo).—Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 592, 1912 (Batavia).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 25, fig. 14, 1913 (Batavia, Tjilatjap, Bagan Api Api, Nias, Balikpapan, Kota Baru).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 316, 1917 (India; Indo-Australian Archip.)—Fowler, Copeia, No. 58, p. 62, 1918 (Philippines); Journ Bombay Nat. Hist. Soc., vol. 30, No. 1, p. 39, 1924 (Calicut).—Hora, Mem. Asiatic Soc. Bengal, vol. 6, p. 481, 1924 (Singora).—Oshima, Annot. Zool. Japon., vol. 11, p. 2, 1926 (Haiho, Hainan).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 258, 1927 (San Fernando; Santa Maria; Orion; Orani); Mem. Bishop Mus., vol. 10, p. 32, 1928 (compiled); Hong Kong Nat., vol. 2, p. 57, fig. 7, 1931 (India; Philippines).—Herre, Journ. Pan-Pac. Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 15, 1934 (Bauang Sur; Manila).—Roxas, Philippine Journ. Sci., vol. 55, p. 256, pl. 1, fig. 13 (scale), pl. 3, fig. 1 (head), 1934 (Luzon; Mindoro; Masbate; Leyte; Samar; Panay; Guimaras; Balabac; Mindanao; Borneo).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 86, 1934 (Bangkok); vol. 87, p. 90, 1935 (Bangkok).—Suvatti, Index Fish. Siam, p. 13, 1937 (Lang Suan; Bangkok; Gulf of Siam; Bang Plasoi; Maenam Canthaburi).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 23, 1937 (reference).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 13, 1937 (Sumatra coast 100 miles west of Singapore).—Fowler, List Fish. Malaya, p. 25, 1938 (reference).

Gonostoma javanicum Kuhl and Van Hasselt, Algemein Konst Letterbode, p. 329, 1823 (type locality: Java).

? *Clupea mauritiana* Bennett, Proc. Zool. Soc. London, pt. 1, p. 32, 1833 (type locality: Mauritius).

Chatoessus tampo Valenciennes, Hist. Nat. Poiss., vol. 21, p. 117, 1848 (type locality: "Dessin du major Farquhar" [Malacca]).—Günther, Cat. Fishes British Mus., vol. 7, p. 406, 1868 (copied).

Anodontostoma hasseltii Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 15, 1849 (type locality: Madura Straits near Kammal and Surabaya; Java Sea near Batavia, Samarang, etc.).

Chatoessus selangkat Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, pp. 16, 47, 1852 (type locality: Batavia, Java).

? *Chatoessus breviceps* Peters, Monatsb. Akad. Wiss. Berlin, 1876, p. 848, 1877 (type locality: New Hannover).

Anodontostoma breviceps Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 316, 1917 (copied).

Depth 2⅒ to 2½; head 3¼ to 3⅓, width 1⅞ to 2. Snout 4⅛ to 4⅘ in head; eye 3⅓ to 4, greater than snout or interorbital or 1⅕ in interorbital with age; maxillary reaches ⅓ to ⅖ in eye, 3 to 3⅕ in head; no teeth; interorbital 2¾ to 3⅛, convexly elevated; many radiating venules on cheek, opercle, postocular and humeral regions. Gill rakers 65+83, finely lanceolate, 2½ in gill filaments, which 1¼ in eye.

Scales 37 to 40 in median lateral series to caudal base and 3 or 4 more on latter; 12 or 13 scales transversely, 10 or 11 predorsal. Abdominal serrae 17 or 18+11 or 12. Scales firmly adherent, narrowly imbricated. Scales with 5 or 6 vertical parallel striae, only most apical one complete, others interrupted medianly; apical edges of scales with about 26 weak crenulations, points more or less extended, though narrow and tips rounded; circuli fine, concentric.

D. iii, 15, i, first branched ray 1¼ to 1½ in head, last branched ray 2⅕ to 2⅔ in first ray; A. ii, 16, i or ii, 17, i, first branched ray 3½ to 4 in head; least depth of caudal peduncle 2 to 3⅛; pectoral 1⅕ to 1⅖; ventral 1⅘ to 2⅛; caudal 2¾ to 3⅛ in rest of body, deeply forked, lobes pointed.

Brownish above, sides and below whitish. Dark slaty humeral blotch about size of eye in depth, only width narrower. Iris shows through adipose eyelid largely slaty. Fins pale.

Mauritius, India, Andamans, Burma, Siam, Malay Peninsula, Pinang, East Indies, Philippines, Hainan, Melanesia.

12074. Cavite market, Luzon. December 1, 1908. Length, 145 mm.
13003. Iloilo market. March 28, 1908. Length, 140 mm.
20823. Lingayen Gulf, east of Point Guecet, west Luzon. May 11, 1909. Length, 90 ? mm., caudal tips broken.
20428. Malampaya River, Palawan. December 26, 1908. Length, 133 mm.
11455 to 11457. Manila market. December 12, 1907. Length, 125 to 143 mm.
11886. Manila market. March 14, 1908. Length, 149 mm.
6262, 8188 to 8190. Manila market. June 12, 1908. Length, 135 to 147 mm.
13674 to 13677. Manila market. June 24, 1908. Length, 141 to 149 mm.
10718. Port Ciego, Balabac. January 3, 1909. Length, 148 mm.
Nine examples. Shore above Iloilo River, Panay, June 2, 1909. Length, 45 to 52 mm.
21389. Sebatic Island, Borneo. January 2, 1909. Length, 97 mm.
20751. Sebatic Island. October 1, 1909. Length, 110 mm.
19910. Sebatic Island. November 3, 1909. Length, 111 mm.
11837. Sandakan Bay, Borneo. March 2, 1908. Length, 126 mm.

5257. Sandakan Bay. March 21, 1908. Length, 108–138 mm. 11 examples.
Two examples. Sebatic Island, Borneo. October 1, 1909. Length, 41–53 mm.
21259, 21260. Tifoe Bay, Bouro Island. Length, 78–85 mm.
U.S.N.M. No. 51981. Negros, Philippines. Dr. Bashford Dean. Length, 82–111 mm. 4 examples.
U.S.N.M. No. 56031. Mindanao, Philippines. Bureau of Fisheries (4225). Length, 205 mm.
U.S.N.M. No. 56065. Luzon, Philippines. Bureau of Fisheries (3231). Length, 190 mm.
U.S.N.M. No. 56308. Cavite, Philippines. Dr. G. A. Lung. Length, 95-143 mm. 2 examples.
U.S.N.M. No 72222. Iloilo, Philippines. R. C. McGregor. Length, 126 mm.
U.S.N.M. No. 72515. Cavite, Philippinues. Length, 151–153 mm. 2 examples.
U.S.N.M. No. 72516. Batavia, Java. 1909. Bryant and Palmer. Length, 212-125 mm. 2 examples.
2 examples. A.N.S.P. Calicut, India. James Hornell. Length, 145–155 mm.

Genus NEMATALOSA Regan

Nematalosa Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 313, 1917. (Type, *Clupea nasus* Bloch, designated by Jordan, Genera of Fishes, pt. 4, p. 560, 1920.)

Mouth toothless, subterminal or inferior, transverse, its cleft forming an angle. Maxillary slender, terminally slightly expanded and curved downward; dentary edge reflected outwards in front of maxillary end; one supplemental maxillary. Veterbrae 43. Scales 44 to 50 in lateral series, 14 to 21 transversely. Dorsal rays 13 to 18, with scaly basal sheath and last ray prolonged in filament. Anal rays 18 to 24. Ventral rays 8, below or little before dorsal.

Coasts and rivers of Asia and Australia, from Arabia to Japan and New South Wales.

ANALYSIS OF SPECIES

a^1. Second suborbital with oblique antero-inferior edge, leaves naked area above lower preopercle limb.
  b^1. Depth 2 to 2½; A. 20 to 22 -- come
  b^2. Depth 2⅗ to 3.
    c^1. A. 19.
      d^1. Depth 2⅗ -- arabica
      d^2. Depth 3 -- elongata
    c^2. A. 21 to 23; depth 3 -- japonica
a^2. Second suborbital covers cheek, front edge vertical and lower edge horizontal and in contact with lower preopercle limb -------------------------- nasus

NEMATALOSA COME (Richardson)

Chatoesus come (Russell) Richardson, Voy. *Erebus* and *Terror*, Fishes, p. 62, 1846 (type locality: Western Australia; Indian Ocean).

Chatoessus come Richardson, Ichth. Voy. *Erebus* and *Terror*, Fishes, pl. 38, figs. 7–9, 1846.—Klunzinger, Arch. Naturg., vol. 38, p. 43, 1872 (Murray River).

Dorosoma come OGILBY, Commerc. Fish, Fisher. Queensland, p. 47, 1915 (Brisbane); Mem. Queensland Mus., vol. 3, p. 133, 1915 (Norman R.).—WAITE, Rec. South Australian Mus., vol. 2, p. 38, fig. 54, 1921.

Nematalosa come REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 314, 1917 (Indo-Australian Archipelago).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 17, pl. 5, fig. 56a, 1927; Austral. Mus. Mem., vol. 5, p. 41, 1929 (reference).

Chatoessus nasus (not Bloch) GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 407, 1868 (part).—KENT, Great Barrier Reef, p. 370, 1893 (Queensland).—WEBER, *in* Semon's Zool. Forsch. Reis. Austral., vol. 5, p. 274, 1895 (Burnett River).

Dorosoma nasus BLEEKER, Atlas Ichth. Ind.-Néerland, vol. 6, p. 142, pl. (2)260, fig. 4, 1866–72.—STEAD, Edible fishes New South Wales, p. 24, pl. 3, 1908.—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 24, 1913 (part).

Chatoessus erebi GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 407, 1868 (type locality: Namoi and Cape York, New South Wales).—CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 184, 1872 (Melbourne market Murray, Darling, Clarence, Burnett and Fitzroy Rivers); Proc. Linn. Soc. New South Wales, vol. 2, p. 24, 1878 (Brisbane River mouth).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 368, 1880 (Burnett and Fitzroy Rivers).—KLUNZINGER, Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, pt. 1, p. 418, 1880 (Murray River).—GÜNTHER, Rep. Voy. *Challenger*, vol. 1, p. 33, 1880 (Tiaro, Mary River; ? lat. 27° 9′ S., long. 144° E.).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 258, 1881 (North and West coasts).—WOODS, Fish Fisher. New South Wales, p. 106, 1882.—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, 1883, p. 209, 1884 (Lower Burdekin River).—OGILBY, Cat. Fish. New South Wales, p. 55, 1886.—KENT, Great Barrier Reef, pp. 302, 370, 1893.—WEBER, *in* Semon's Zool. Forsch. Reis. Australia, vol. 5, p. 274, 1895 (Burnett River).

Chaetoessus erebi MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 71, 1883 (Palmer River).

Nematalosa erebi REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 314, 1917 (Cape York, Burnett River, Mary River, New South Wales).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 17, 1927; Austral. Mus. Mem., No. 5, p. 41, 1929 (reference).

Chatoessus richardsoni CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 144, 1873 (type locality: Rivers of Murray River system, Australia).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 369, 1880 (Murrumbidgee); vol. 6, p. 258, 1881 (Murray basin).—WOODS, Fish Fisher. New South Wales, p. 106, 1882.—OGILBY, Cat. Fishes New South Wales, p. 55, 1886.—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 37, 1890 (reference).—OGILBY, Edible Fishes New South Wales, p. 178, 1893.

Nematalosa richardsoni WAITE, Rec. South Austral. Mus., vol. 3, p. 225, pl. 13, 1927.—MCCULLOCH, Austral. Mus. Mem., vol. 5, p. 41, 1929 (reference).

Chatoessus horni ZEITZ, Rep. Horn Sci. Exped., vol. 2, p. 180, pl. 16, fig. 6, 1896 (type locality: Red Bank Creek, McDonnell Ranges, Central Australia).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).

Nematalosa horni Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 314, 1917 (types from Red Bank Creek; Bulloo Creek in Queensland; Borwan River in New South Wales).—McCulloch, Fishes of New South Wales, ed. 2, p. 17, 1927.

Depth 2¼ to 2⅗; head 3⅘ to 4, width 1⅞ to 2⅕. Snout 4½ in head, protrudes well beyond eye; eye 4½, 1 in eye, 1⅕ in interorbital, adipose lids largely covering eye; maxillary reaches ⅕ in eye, length 4 to 4¼ in head; interorbital 3½ to 3⅖, rather broadly convex; opercle smooth. Gill rakers 185+218, setiform, slender, 2⅓ to 2⅔ in gill filaments, which 1½ in eye.

Scales 36 in median lateral series to caudal base and 4 more on latter; 15 scales transversely, 21 predorsal. Abdominal serrae 15+12. Ventral axillary scale ⅖ of fin. Scales with 6 or 7 marginal striae, of which 1 crosses scale transversely or vertically; circuli as transverse close-set vertical striae; apically continuous portion with radiating flutings crossed by waved transverse striae.

D. iv, 10, first branched ray 1⅓ in head, last elongated ray 2¾ to 3¼ in combined head and body to caudal base; A. ii, 16 to 18, first branched ray 2⅞ to 3⅓; caudal 2⅞ to 3 in rest of body, deeply forked, slender lobes pointed; least depth of caudal peduncle 2⅛ to 2¼ in head; pectoral 1⅕; ventral 1¾ to 1⅘.

Back olivaceous, with steel-blue reflections. Sides and lower surfaces, also iris, silvery white. Dorsal and caudal brownish, lower fins pale.

Western Australia, Queensland, New South Wales.

U.S.N.M. No. 47866. Mary River. Australian Museum. Length, 255 mm.
U.S.N.M. No. 47867. Burdekin River. Australian Museum. Length, 245 mm.

NEMATALOSA ARABICA Regan

Nematalosa arabica Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 313, 1917 (type locality: Muscat).

Depth 2⅗; head 3⅖. Snout equals eye, which 4½ in head; maxillary reaches ¼ in eye; second suborbital with oblique lower edge, leaves naked space above lower limb of preopercle.

Scales 50 in medial lateral series, 19 transversely. Ventral scutes 18+13.

D. 17; A. 19; ventral little before middle of dorsal.

Dark longitudinal streaks along series of scales on upper part of body. Length, 150 mm. (Regan.)

Arabia. Known only from type.

NEMATALOSA ELONGATA (Macleay)

Chatoessus elongatus Macleay, Proc. Linn. Soc. New South Wales, vol. 8, 1883, p. 209, 1884 (type locality: Lagoons, Mary River, Queensland).—Macleay, Proc. Linn. Soc. New South Wales, vol. 9, p. 59, 1884 (compiled).—Kent, Great Barrier Reef, p. 370, 1893.

Nematalosa elongata JOHNSTON and BANCROFT, Proc. Roy. Soc. Queensland, vol. 33, p. 177, 1921 (mortality at Longreach, Thomson River).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—MCCULLOCH, Austral. Mus. Mem., vol. 5, p. 132, 1929 (reference).

Depth 3, little more than head; profile of head somewhat flatter than in *Nematolosa come*. Eye ⅔ hidden by adipose membrane.

Scales 42 in median lateral series. Abdomen strongly serrated its whole length, scales not deciduous.

D. 14, last ray reaches caudal origin; A. 19; ventral begins opposite third dorsal ray.

Silvery, with back and fins darker. Length, 280 mm. (Macleay.)

Queensland, in fresh water.

NEMATALOSA JAPONICA Regan

Nematalosa japonica REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 313, 1917 (type locality: Inland sea of Japan).

Depth 3; head 4⅓. Snout equals eye, which 4½ in head; maxillary reaches ⅓ in eye; second suborbital with oblique lower edge, leaves naked space above lower limb of preopercle.

Scales 48 to 50 in medial lateral series, 19 or 20 transversely. Ventral scutes 19 or 20+12 to 14.

D. 16 to 18; A. 21 to 23; ventral below front or middle part of dorsal.

A dark humeral spot. Length, 200 mm. (Regan.)

Japan. Described from 3 specimens.

NEMATALOSA NASUS (Bloch)

Clupea nasus BLOCH, Naturg. ausländ. Fische, vol. 9, p. 116, pl. 429, fig. 1, 1795 (type locality: Malabar).—SCHNEIDER, Syst. Ichth. Bloch, p. 426, 1801 (Malabar).—CUVIER, Règne animal, vol. 2, p. 174, 1817 (reference); ed. 2, vol. 2, p. 320, 1829 (on *Kome* Russell, Fishes of Coromandel, vol. 2, p. 76, pl. 196, 1803, Vizagapatam).

Chatoessus nasus SWAINSON, Nat. Hist. Animals, vol. 2, p. 293, 1839 (copied).—VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 104, 1848 (Pondicherry; Bombay).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 18, 1853 (reference).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 407, 1868 (part).—DAY, Fishes of India, pt. 4, p. 634, pl. 160, fig. 4, 1878 (India).—BOULENGER, Proc. Zool. Soc. London, 1887, p. 666 (Muscat).—DAY, Fauna Brit. India, Fishes, vol. 1, p. 387, fig. 120, 1889.—ELERA, Cat. Fauna Filip., vol. 1, p. 581, 1895 (Luzon: Manila).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 116, 174, 1929 (Thudaunot).

Dorosoma nasus BLEEKER, Atlas Ichth. Ind. Néerland, vol. 6, p. 142, pl. (2) 260, fig. 4, 1866–72 (Java, Singapore, Banka, Celebes, Batjan, Obi Major, Amboina, Ceram, Philippines).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 156, 1907 (Tamarida, Kor Garrieh, Gischin).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 24, 1913 (Bleeker's specimen).—OSHIMA, Annot. Zool. Japon., vol. 11, p. 2, 1926 (Haiho, Hainan).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1ᵉ note, p. 7, 1926 (Tonkin).—Deraniyagala, Spolia Zeylanica, vol. 15, p. 45, 1929.—Tanaka, Jap. Fish. Life Colours, No. 44, 1933.

Konosirus nasus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 53, 1901 (reference).—Jordan and Herre, Proc. U. S. Nat. Mus., vol. 31, p. 625, 1906 (East Indies, north to southern Japan).—Seale and Bean, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907.

Clupanodon nasus Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 328, 1902 (Formosa, Giran, Kotosho).

Clupanadon nasus Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Chinnampo, Korea) (error).

Nematalosa nasus Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 313, 1917 (Sind, Bombay, Canara, Madras, Calicut, Burma).—Fowler, Hong Kong Nat., vol. 2, p. 56, fig. 6, 1931 (compiled).—Herre, Fishes Herre Philippine Exped., 1931, p. 15, 1934 (Culion).—Roxas, Philippine Journ. Sci., vol. 55, p. 254, pl. 1, fig. 1 (scale), pl. 3, fig. 2 (head), 1934 (Luzon; Panay; Palawan; Mindanao; Amoy, China).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 231, 1937 (reference).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 13, 1937 (Sumatra coast 100 miles west of Singapore).—Fowler, List Fish. Malaya, p. 25, 1938 (reference).

Anodontostomus nasus Suvatti, Index Fish. Siam, p. 14, 1937 (Thale Sap Songkhla; Canthaburi; Pak Phayun; Thale Noi).

Clupea thrissa (not Linnaeus) Bonnaterre, Tableau Encyclop. Ichth., p. 188, pl. 76, 1788 (Sea of the Indies).

Konosirus thrissa Jordan and Seale, Proc. Davenport Acad. Sci., vol. 10, p. 2, 1905 (Hong Kong).—Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 167, 1909 (Takao).

Clupanodon nasica Lacépède, Hist. Nat. Poiss., vol. 5, pp. 468, 472, 1803 (Malabar; on Bloch).

Chatoessus altus Gray, Illustr. Indian Zool. Hardwicke, vol. 2, p. 91, fig. 2, 1932–34 (type locality: India).—Jerdon, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.—Day, Fishes of Malabar, p. 243, 1865.

Chatoessus selangkat (not Bleeker) Kner, Reise *Novara*, Fische, p. 337, 1865 (Java).

Chatoessus chanpole (not Buchanan-Hamilton) Günther, Cat. Fishes British Mus., vol. 7, p. 410, 1868 (no locality).

Depth 2⅗ to 2⅘; head 3⅔ to 4. Snout long as or shorter than eye, which 3⅓ to 4 in head; maxillary reaches ¼ in eye; second suborbital covering cheek, with vertical anterior edge and horizontal inferior edge attached to lower limb of preopercle.

Scales 45 to 50 in medial lateral series; 15 to 19 transverse. Ventral scutes 16 to 19+10 to 12. D. 15 to 17; A. 21 to 24; ventrals below origin or anterior third of dorsal.

Dark longitudinal streaks along upper series of scales. Often a dark humeral spot. Length, 200 mm. (Regan.)

India, Burma.

Genus CLUPANODON Lacépède

Clupanodon Lacépède, Hist. Nat. Poiss., vol. 5, p. 465, 1803. (Type, *Clupea thrissa* Linnaeus, designated by Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 112, 1866–72.) (Type, *Clupanodon jussieu* Lacépède, designated by Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, p. 574, 1882, invalid.)

Thrissa Rafinesque, Analyse de la nature, p. 88, 1815. (Type, *Clupea thrissa* Linnaeus, virtually. *Thrissa* Rafinesque, proposed to replace *Clupanodon* Lacépède.)

Konosirus Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 349, 1900. (Type, *Chatoessus punctatus* Schlegel, orthotypic.)

Konoshirus Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 53, 1901. (Type, *Chatoessus punctatus* Schlegel.)

Nealosa Herre and Myers, Lingnan Sci. Journ., No. 10, p. 236, 1931. (Type, *Chatoessus punctatus* Schlegel, orthotypic.)

Mouth terminal or subterminal, with lateral cleft and toothless. Maxillary normal, reaches front or middle part of eye; front supplemental maxillary absent. Gill rakers slender, very numerous. Vertebrae 49 to 51. Scales 48 to 58 in lateral series, 20 to 23 transversely. Dorsal rays 15 to 18, last ray prolonged in filament. Anal rays 20 to 28, low. Ventral rays 8, fin below front part of dorsal.

Shores and rivers of China and Japan.

ANALYSIS OF SPECIES

a^1. Depth 2⅔ to 3¼; scales 48 -- thrissa
a^2. Depth 3 to 3½; scales 53 to 58 ---------------------------------- punctatus

CLUPANODON THRISSA (Linnaeus)

Clupea thrissa Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 318, 1758 (type locality: Indian Ocean; on Lagerstrom, 1750; Osbeck, 1757).—Osbeck, Reise Ost Ind. China, p. 336, 1765 (China).—Broussonet, Ichth., vol. 1, no pagination, pl., 1782 (India, China; not Carolina and Jamaica).—Houttuyn, Verh. Holland. Maatsch. Haarlem, vol. 20, p. 341, 1782 (Japan).—Bonnaterre, Tableau encyclop. Ichth., p. 186, (not pl. 76, fig. 315), 1788 (part; Sea of the Indies).—Gmelin, Syst., Nat. Linn., vol. 1, p. 1406, 1789 (India, China, Japan).—Bloch, Naturg. ausländ. Fische, vol. 9, pl. 404, 1795.—Forster, Fauna Indica, p. 16, 1795.—Schneider, Syst. Ichth. Bloch, p. 424, 1801 (India, China, Japan).—Cuvier, Règne animal, ed. 2, vol. 2, p. 174, 1829 (reference).

Clupanodon thrissa Lacépède, Hist. Nat. Poiss., vol. 5, pp. 468, 470, 1803 (China).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 309, 1917 (Formosa and China).—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 103, 1928 (Bombay); Mem. Bishop Mus., vol. 10, p. 32, 1928 (compiled); Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 599, 1930 (Hong Kong); Hong Kong Nat. vol. 2, p. 54, 1931 (Hong Kong).

Dorosoma thrissa Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 63 (Swatow).—Tanaka, Jap. Fish. Life Colours, No. 43, 1933.

Konosirus thrissa Jordan and Seale, Proc. Davenport Acad. Sci., vol. 10, p. 2, 1905 (Hong Kong).—Jordan and Herre, Proc. U. S. Nat. Mus., vol. 31, p. 626, 1906 (compiled).—Evermann and Seale, Bull. Bur. Fisher., vol. 26, 1906, p. 54, 1907 (Philippines).—Herre, Fish Herre Philippine Exped. 1931, p. 15, 1934 (Sitanki).

Chatoessus osbecki Valenciennes, Hist. Nat. Poiss., vol. 21, p. 106, 1848 (type locality: China).—Günther, Cat. Fishes British Mus., vol. 7, p. 406, 1868 (copied).

Clupanadon osbecki Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Jinsen, Korea) (error).

Chatoessus triza Richardson, Ichth. China Japan, p. 307, 1846 (type locality: China Sea).

Chatoessus chrysopterus Richardson, Ichth. China Japan, p. 308, 1846 (type locality: China Sea).

Chatoessus maculatus (Gray) Richardson, Ichth. China Japan, p. 308, 1846 (type locality: Canton; Chinese Sea).—Valenciennes, Hist. Nat. Poiss., vol. 21, p. 108, 1848.—Günther, Cat. Fish. Brit. Mus., vol. 7, p. 409, 1868 (Formosa).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^{e} note, pp. 30, 174, 1929 (Hué).—Chevey, Inst. Océanogr. Indochine, 19^{e} note, p. 8, 1932 (Indochina).

Clupanodon maculatus Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 327, 1902 (Giran, Formosa).

Amblygaster maculatum Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 166, 1909 (copied 1902).

Chatoessus nasus (not Bloch) Günther, Cat. Fishes British Mus., vol. 7, p. 407, 1868 (Cochin, Java, Amboina, Philippines).—Ramsay and Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 1, p. 8, 1886 (Strickland River, New Guinea).

Konosirus nasus Smith and Pope, Proc. U. S. Nat. Mus., vol. 31, p. 462, 1906 (Urado).—Seale and Bean, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).

Clupea (*Clupanodon*) *libertatis* (not Günther) Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 118, 1874 (Chinese drawing).

Chatoessus punctatus (not Schlegel) Elera, Cat. Fauna Filip., vol. 1, p. 582, 1895 (Luzon, Cavite, Santa Cruz).

Clupanodon paihoensis Oshima, Annot. Zool. Japon., vol. 11, p. 3, 1926 (type locality: Haiho, Hainan).

Depth 2¾ to 3¼; head 3⅛ to 3⅗, width 2⅕ to 2⅞. Snout 4 to 4¼ in head, mandible tip well inferior or snout protruding; eye 3⅖ to 4¼, greater than snout in young to 1 to 1⅛ in snout with age, greater than interorbital in young to equal with age; broad adipose lids cover ⅓ of eye in front and behind; maxillary reaches ¼ to ⅓ in eye, expansion 2 in eye, length 2⅔ to 3 in head; interorbital 4⅛ to 4⅓, slightly convex. Gill rakers 215+220 (132+160? in young), fine, setiform, slightly longer than gill filaments or 1¼ to 2⅕ in eye.

Scales 44 or 45 in median lateral series to caudal base and 3 or 4 more on latter; 17 scales transversely, 16 predorsal. Abdominal serrae 17 to 19+10 to 12. Postocular, occipital and suprascapular region, cheek and preopercle venulose. Scales with 2 or 3 vertical striae, sometimes these or only 1 complete, besides many fine parallel vertical striae; broadly entire vertically.

D. iii or iv, 12, i or 13, i, first branched ray 1⅖ to 1⅞ in head, last ray 1⅒ to 1⅕ in head in young or 2¾ to 2⅘ in combined head and body to caudal base with age; A. ii or iii, 19, i to 23, i, first branched ray 3⅖ to 4¼ in head; least depth of caudal peduncle 2¼ to 3; pectoral 1⅓ to 1⅗; ventral 2⅕ to 2¾; caudal 3⅛ to 3¼ in combined head and body to caudal base.

Back slate gray, sides and below white. Six dark slate-black blotches along upper side to back from behind suprascapula, first largest, others gradually smaller. Iris yellowish white. Fins brownish. Dorsal and caudal with little dusky terminally.

India, East Indies, Philippines, Cochin China, Hainan, China, Formosa, Japan, Korea.

U.S.N.M. No. 6495. Hong Kong? Length, 187 or 188 mm. 2 examples.

U.S.N.M. No. 56105. Philippine Islands. Bureau of Fisheries (4171). Length, 203 mm. As *Konosirus thrissa.*

U.S.N.M. No. 57625. Japan. P. L. Jouy. Length, 170–205 mm. 2 examples.

U.S.N.M. No. 58043. Zamboanga. Dr. E. A. Mearns. 1906. Length, 140–185 mm. 4 examples.

U.S.N.M. No. 59802. Urado, Japan. Dr. H. M. Smith. Length, 130–180 mm. 3 examples.

3 examples. A.N.S.P. Bombay, India. Prof. F. Hallberg. Length, 85–104 mm.

2 examples. A.N.S.P. Hong Kong. April 26, 1929. Henry W. Fowler. Length, 168–176 mm.

11807 to 11810. Panabutan Bay, Mindanao. February 5, 1908. Length, 167–185 mm.

5009. Panabutan Bay. February 6, 1908. Length, 210 mm.

17552. Sorsogon market. March 12, 1909. Length, 177 mm.

1 example. Sandakan Bay, Borneo. March 2, 1908. Length, 100 mm.

6318, 9959. Kowloon market, China. September 18, 1908. Length, 170?–178 mm.

1 example. Japan. P. L. Jouy. Length, 93 mm.

CLUPANODON PUNCTATUS (Schlegel)

Chatoessus punctatus SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 240, pl. 109, fig. 1, 1846 (type locality: Bays on coast of southwest Japan).—VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 107, 1848 (copied).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. (18) 50, 1853 (Nagasaki); (Japan), vol. 26, p. 6, 1857 (Nagasaki); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 3, p. 6, 1858 (Japan); Nederland. Tijdschr. Dierk., vol. 2, p. 57, 1865 (Amoy).—KNER, Reise *Novara*, Fische, p. 336, 1865 (Madras; Tahiti).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 408, 1868 (Japan, Amoy, type of *Chatoessus aquosus*); Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 158, 1874 (Chefoo).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 404, 1876 (Yeddo and Yokohama).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 9, 1897.—GÜNTHER, Ann. Mag. Nat. Hist., ser. 7, vol. 1, p. 263, 1898 (Newchang, North China).

Dorosoma punctatum RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 62 (Swatow).

Konosirus punctatus JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 349, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 53, 1901 (reference).—SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 462, 1906 (Urado).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 624, 1906 (Tokyo, Nagasaki, Matsushima Bay).—FRANZ, Abh. Bayer Akad. Wiss., vol. 4, Suppl. vol. 1, p. 5, 1910 (Sagami Bay and Misaki).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Tokyo, Misaki, Kagoshima).—JORDAN and THOMPSON, Mem. Carnegie Mus., vol. 6, p. 208, 1914 (Nogoya).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 184, 1920 (Jusangata).—WU, Contr.

Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 18, fig. 14, 1929 (Amoy).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 37, 1930 (Far East seas).

Clupanodon punctatus Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 309, 1917 (China and Japan).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 120, 1925 (Misaki, Miakawa Bay, Kagoshima Bay, Fukui, Miyazu, Tokyo, Kyoto).—Fowler, Mem. Bishop Mus., vol. 10, p. 32, 1928 (compiled).—Schmidt and Lindberg, Bull. Acad. Sci. U. S. S. R., 1930, p. 1187 (Tsuruga).—Fowler, Hong Kong Nat., vol. 2, p. 55, fig. 5, 1931 (compiled).—Schmidt, Bull. Acad. Sci. U. S. S. R., 1931, p. 103 (Obama); Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 18, 1931 (Nagasaki; Kagoshima).—Ikeda, Hakubutugaku Zassa, vol. 36, p. 583, 1937 (Momotori-Mura).

Clupanadon punctatus Mori, Journ. Pan Pacific Res. Inst., vol. 3, 1928 (Fusan, Korea) (error).

Chatoessus aquosus Richardson, Ichth. China Japan, p. 307, 1846 (type locality: Chinese Sea).—Valenciennes, Hist. Nat. Poiss., vol. 21, p. 109, 1848 (compiled).

Clupanodon thrissa (not Linnaeus) Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 743, 1900 (Yokohama).

Depth 3⅛ to 3⅖; head 3⅕ to 3⅓, width 2⅔ to 2¾. Snout 5 to 5½ in head, mandible tip only slightly inferior; eye 4⅔ to 5¾, 1⅛ to 1⅕ in snout, 1⅕ to 1½ in interorbital, broad lids largely cover eye; maxillary reaches ¼ to ½ in eye, expansion 1⅘ to 2½ in eye, length 2¾ to 3⅕ in head; interorbital 4 to 4⅖, broadly convex. Gill rakers 182+170 (in medium-sized example), setiform, subequal with gill filaments or 1½ in eye.

Scales 42 to 46 in median lateral series to caudal base and 4 or 5 more on latter; 17 scales transversely, 20 to 26 predorsal. Abdominal serrae 20+13 to 15. Axillary ventral scale ⅗ of fin. Scales with single transverse or pronounced vertical stria; circuli extend over entire scale area as fine close set vertical striae.

D. iii, 14, i, first branched ray 1⅔ to 1¾ in head, last ray 1⅛ to 2⅔ in combined head and body measured to caudal base; A. iii, 17, i, first branched ray 3⅔ to 4 in head; caudal 1 to 1⅛; least depth of caudal peduncle 3⅕ to 3⅔; pectoral 1⅗ to 1⅘; ventral 2⅖ to 2½.

Back gray or brown, with metallic bluish reflections. Each scale on back with small round dusky basal spot, appearing as longitudinal rows. Sides of head and body silvery white. Usually dark or dusky humeral blotch or bar, equals vertical eye diameter. Iris whitish. Dorsal and caudal pale brownish, lower fins whitish.

India, China, Japan, Korea, Polynesia.

U.S.N.M. No. 22538. Japan. Japanese Government. Length, 93–220 mm. 6 examples.

U.S.N.M. No. 26245. Japan. 1878. E. E. Morse. Length, 135–154 mm., caudal ends broken. 10 examples.

U.S.N.M. No. 37759. Korea. Bernandon. Length, 104 mm., caudal ends broken.

U.S.N.M. No. 38837. Tokyo market. Educational Museum of Tokyo. Length, 245 mm.

U.S.N.M. No. 44891. Japan. Japanese Government. Length, 198?–225 mm. 4 examples.

U.S.N.M. No. 49506. Tokyo. *Albatross* collection. Length, 163–215 mm. 2 examples.

U.S.N.M. No. 57624. Japan. P. L. Jouy. Length, 192 mm.

U.S.N.M. No. 59803. Urado, Japan Dr. H. M. Smith. Length, 155 mm.

U.S.N.M. No. 71048. Tokyo market. *Albatross* collection. 1906. Length, 190–198 mm. 3 examples.

U.S.N.M. No. 71050. Japan. *Albatross* collection. Length, 225 mm.

U.S.N.M. No. 82607. Wakanoura, Japan. Jordan and Snyder. Length, 95–104 mm. 2 examples.

Family STOLEPHORIDAE

Body elongated, belly rounded. Jaws nearly or quite equal. Mouth terminal, rather small, bordered by small premaxillary and long maxillary; maxillary broad and rounded behind, with 2 supplemental bones. Small teeth in jaws, on vomer, palatines, pterygoids and tongue, which deciduous or may be absent, none caninelike. Gill membranes separate, free from isthmus. Gill rakers very fine and slender, not numerous. Pseudobranchiae present. Branchiostegals 6 to 15. Scales moderate or large, thin, deciduous. Belly without scutes and covered with surrounding scales. Fins small; anal short.

Small clupeids of tropical or subtropical seas, well distinguished as the round herrings, as their bellies rounded and without scutes or spines.

ANALYSIS OF GENERA

a^1. Dorsal inserted above ventrals; teeth feeble or absent; dorsal with less than 18 branched rays.
  b^1. Dorsal origin nearer snout tip than caudal; anal rays 9 to 13_ **Stolephorus**
  b^2. Dorsal origin nearer caudal than snout tip; anal rays 15 to 17 **Dussumieria**
a^2. Dorsal well before ventrals; teeth moderate; dorsal branched rays 18 to 29; anal rays 11____ **Etrumeus**

Genus STOLEPHORUS Lacépède

Stolephorus LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 381, 1803. (Type, *Atherina japonica* Houttuyn, designated by Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 272, 1883.)

Spratelloides BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, pp. 12, 29, 1852. (Type, *Clupea argyrotaeniata* Bleeker=*Clupea gracilis* Schlegel, monotypic.)

Gilchristella FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 365, 1935. (Type, *Spratelloides aestuarius* Gilchrist, orthotypic.)

Body elongate, somewhat compressed. Tail very short. Snout conic. Adipose eyelids mostly obsolete. Jaws nearly or quite equal. Mouth cleft small, bordered by elongate premaxillary and broad maxillary, which rounded behind and with 2 supplemental bones. No teeth, or if present very minute or deciduous in jaws, on vomer, pterygoids and tongue. Gill membranes separate, free from isthmus. Pseudobranchiae large. Branchiostegals 6, flat. Scales deciduous, large, thin. Dorsal short, inserted opposite ventral or nearer snout tip than caudal base. Anal very short, rays 9 to 15.

Indo Pacific. Small, brilliant silvery little round herrings, with small fins.

ANALYSIS OF SPECIES

a^1. Scales in lateral line 35 to 38; no silvery white lateral band.
  b^1. A. 9 to 10 ---------- **delicatulus**
  b^2. A. 11 to 12 ---------- **alburnus**
a^2. Scales in lateral line 40 to 44.
  c^1. No brilliant silvery white lateral band; A. 9 ---------- **robustus**
  c^2. Brilliant silvery white lateral band present.
    d^1. A. 13 ---------- **japonicus**
    d^2. A. 19 to 21 ---------- **madagascariensis**

STOLEPHORUS DELICATULUS (Bennett)

Clupea delicatula Bennett, Proc. Comm. Zool. Soc. London, vol. 1, p. 168, 1831 (type locality: Mauritius).

Spratelloides delicatulus Günther, Cat. Fishes British Mus., vol. 7, p. 464, 1868 (East Indies and Australia).—Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 96, pl. (6) 264, fig. 3, 1866–72 (Singapore, Banka, Celebes, Halmaheira, Ternate, Amboine, Saparoua, Banda).—Schmeltz, Cat. Mus. Godeffroy, No. 5, p. 37, 1874 (Samoa).—Peters, Monatsb. Akad. Wiss. Berlin, 1876, p. 445 (Mauritius).—Alleyne and Macleay, Proc. Linn. Soc. New South Wales, vol. 1, p. 350, 1877 (Darnley I.).—Schmeltz, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Samoa).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 260, 1881 (reference).—Pöhl, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Samoa).—Kent, Breat Barrier Reef, pp. 302, 370, 1893 (Queensland).—Regan, Ann. Natal Gov. Mus., vol. 1, p. 242, 1908 (Kosi Bay).—Günther, Jour. Mus. Godeffroy, pt. 16, p. 383, 1909 (Samoa, Jaluit, Bonham Islands).—Weber, *Siboga* Exped., Fische, vol. 57, p. 4, 1913 (Kangeang Island, Siau, Karkaralang, Salibabu, Obi Major, between Fau and Gebe, between Gusi Bay and Ceram Laut, Saleyer, Tuir Island).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 20, 1913.—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, p. 296, 1917 (reference).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 110, 1925 (Zululand coast).—Chabanaud, Service Océanogr. Péches Indo-Chine, 1ᵉ note, p. 7, 1926 (Annam coast; Tonkin).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ Note, p. 122, 1929 (Cochinchina).—Hardenberg, Treubia, vol. 14, livr. 2, p. 216, 1933 (Thousand Is. near Batavia; Karimon Djawa; Bawean; Kangean Archipelago).—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 14, 1934 (Calapan; Culion; Dumaguete; Sitanki).—Roxas, Philippine Journ. Sci., vol. 55, p. 250, 1934 (Bacon).—Herre, Mid-Pacific Mag., vol. 10, p. 163, No. 2, April-June 1935 (Pelew Islands).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 23, 1937 (reference).

Stolephorus delicatulus Jordan and Seale, Bull. Bur. Fisher., vol. 25 (1905), p. 186, 1906 (Apia and Pago Pago).—Seale, Occ. Pap. Bishop Mus., vol. 4, No. 1, p. 5, 1906 (Shortland Island, Solomons).—Evermann and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 53, 1907 (Bulan, Bacon).—Kendall and Golds-

BOROUGH, Mem. Mus. Comp. Zool., vol. 26, p. 243, 1911 (Taritari, Gilbert Islands; Arhno; Marshall Islands; Rangiroa, Paumotus).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 20, 1913 (Saleyer, Karakaralong Islands, Lirung, Obi major, between Gisser and Ceram Laut; Gebe).—OGILBY, Mem. Queensland Mus., vol. 5, p. 97, 1916 (Murray Island).—FOWLER, Occ. Pap. Bishop Mus., vol. 8, No. 7, p. 375, 1923 (Honolulu); Bishop Mus. Bull. 22, p. 4, 1925 (Guam).—FOWLER and BALL, Bishop Mus. Bull. 26, p. 6, 1925 (Lisiansky).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1927, p. 256 (Bacon); Mem. Bishop Mus., vol. 10, p. 29, 1928 (Honolulu, Shortland Island, Fate, Laie Beach, Lisiansky, Guam, Tongatabu, Gilbert Islands, Arhno Atoll, Rangiroa, Kauai).—WHITLEY, Proc. Linn. Soc. New South Wales, vol. 54, p. 92, 1929 (Ontong Java, Lord Howe Group, Melanesia).—MCCULLOCH, Austral. Mus. Mem., vol. 5, p. 37, 1929 (Queensland; South Australia).—FOWLER, Mem. Bishop Mus., vol. 11, No. 5, p. 315, 1931 (reference); Hong Kong Nat., vol. 2, p. 112, 1931 (reference).—HERRE, Field Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 32, 1936 (Fiji, New Hebrides, Solomons).—FOWLER, List Fish. Malaya, p. 24, 1938 (reference).

Clupea flosmaris RICHARDSON, Ichth. China Japan, p. 305, 1846 (type locality: Chinese Seas; Canton, Canton River).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 412, 1868 (copied).

Clupea macassariensis BLEEKER, Journ. Indian Arch., vol. 3, p. (69) 72, 1849 (type locality: Macassar).

Clupeoides macassariensis BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 17, 1852.

Sardinella sirm (not Walbaum) JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, 1905, p. 770, 1906 (Negros).

Sardinella clupeoides (not Bleeker) JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, 1905, p. 770, 1906 (Negros).

Depth 4 to 5⅘; head 2¾ to 4¼, width 2⅛ to 2⅘. Snout 3⅕ to 4 in head from snout tip; eye 3 to 3⅔, greater than snout to subequal with age, always greater than interorbital; maxillary reaches to or slightly beyond front eye edge, expansion 2 to 2⅛ in eye, length 2½ to 3 in head from snout tip; interorbital 3⅘ to 5¼, little convex. Gill rakers 6 to 10+21 to 30, finely lanceolate, little longer than gill filaments or ¾ to eye.

Scales 32 to 36 in median lateral series to caudal base and 3 more on latter; 7 to 9 transverse, 12 to 15 predorsal. Scales with 2 to 7 vertical striae, often irregular.

D. II, 9 or II, 10, first branched ray 1⅔ to 1¾ in total head length; A. II, 7, I or II, 8, I, first branched ray 4 to 4⅓; caudal 1⅔ to 1⅘, forked; least depth of caudal peduncle 2⅘ to 3⅓; pectoral 1¾ to 1⅞; ventral 1⅞ to 2½.

Back slaty, line of demarcation above eye well contrasted from silvery white of eye and lower surface. Fins pale.

Zululand, Natal, Mauritius, Singapore, East Indies, Philippines, China, Queensland, Lord Howe Island, Melanesia, Micronesia, Polynesia, Hawaii. I cannot but think that Richardson's account, based on a drawing, must pertain to this fish. The only disagreement is his statement "Length of figure 6 inches" whereas *Stolephorus delicatulus* reaches only 80 mm. This would hardly be an exaggeration of his artist? In life *Stolephorus delicatulus* has the back dark blue, well contrasted with the bright silvery white sides and lower surfaces.

3 examples. Atulayan Bay, Luzon. June 17, 1909. Length, 31–48 mm.
98 examples. Balalo Bay. Electric light. December 20, 1908. Length, 27–54 mm.
1 example. Balamban, Cebu. April 2, 1908. Length, 70 mm.
5 examples. Balikias Bay. July 14, 1909. Length, 65–74 mm.
9303. Biri Channel. June 1, 1909. Length, 46 mm.
8 examples. Bongao Anchorage. February 22, 1908. Length, 42–65 mm.
4 examples. Busin Harbor, Burias Island. April 22, 1908. Length, 23–28 mm.
45 examples. Cagayan, Sulu Island. January 8, 1909. Length, 33–65 mm.
15081, 15082, 15084. Capulaan Bay, Pigbilao Island. February 24, 1909. Length, 64–70 mm.
18 examples. Cataingan Bay, Masbate. April 18, 1908. Length, 33–72 mm.
19892. Daisy Island, west of Bumbum. January 6, 1910. Length, 52–60 mm. 9 examples.
D. 5451. East Point (Batan Island), S. 38° E., 8.2 miles (lat. 13°22′22″ N.. long. 124°00′48″ E.). June 5, 1909. Length, 20 mm.
34 examples. Catbalogan, Samar. April 16, 1908. Length, 55–73 mm.
3 examples. Cebu market. September 4, 1909. Length, 53–58 mm. [1891.]
2 examples. Galera Bay, Mindoro. June 9, 1908. Length, 74–79 mm.
7389. Gigoso Point, Quinapundan Bay, Samar. July 28, 1909. Length. 39 mm.
26 examples. Grande Island reef. Dynamite. January 8, 1908. Length, 36–72 mm.
35 examples. Guijulugan, Negros. April 2, 1908. Length, 28–46 mm.
64 examples. Inamucan Bay, Mindanao. August 8, 1909. Length, 57–70 mm.
6 examples. Jolo anchorage, Jolo. March 5, 1908. Length, 30–64 mm.
7744 to 7749. Jolo market, Jolo. February 12, 1908. Length, 81–84 mm.
14684. Langao Point, Luzon. June 24, 1909. Length, 57–68 mm. 13 examples.
8727. Little Santa Cruz Island. May 28, 1908. Length, 56 mm.
15660, 15661. Mactan Island. March 25, 1909. Length, 55–59 mm.
19 examples. Maculabo Island. June 13, 1909. Length, 17–25 mm.
7875. Maculabo Island. June 14, 1909. Length, 53–75 mm. 5 examples.
1 example. Malcochin Harbor, Malcochin Island. December 18, 1908. Length, 24 mm.
27 examples. Mansalay, Mindoro. June 4, 1908. Length, 38–64 mm.
16 examples. Maribojac, Bohol. March 25, 1909. Length, 33–57 mm.
277 examples. Matnog Bay, Luzon. May 31, 1909. Length, 18–64 mm.
1 example. Nogas Point, Panay. February 3, 1908. Length, 60 mm.
3 examples. Panubatan Bay, Mindanao. February 5, 1908. Length, 41–60 mm.
15651 to 15653. Paron Point, Luzon. June 21, 1909. Length, 58–60 mm.
2 examples. Port Dupon, Leyte. March 17, 1909. Length, 41–43 mm.
69 examples. Port Galera, Mindoro. June 9, 1908. Length, 28–76 mm.
47 examples. Port Jamelo, Luzon. July 13, 1908. Length, 35–63 mm.
2 examples. Port Matalvi, Luzon. November 23, 1908. Length, 39–43 mm.
4 examples. Port Uson, west of Pinas Island. December 17, 1908. Length, 56–66 mm.
4 examples. Romblon Harbor, Romblon. March 25, 1908. Length, 76–83 mm.

13 examples. San Miguel Harbor, Ticao Island. April 21, 1908. Length, 20–79 mm.

11 examples. San Miguel Harbor, Ticao Island. April 25, 1908. Length, 52–83 mm.

8280. San Miguel Island, Tabaco Bay. June 4, 1909. Length, 40 mm.

22072. Santa Cruz, Marinduque Island. April 24, 1908. Length, 62–72 mm.

10 examples. Tataan, Simaluc Island. February 10, 1908. Length 60–75 mm.

22623. Tataan anchorage. February 21, 1908. Length, 65–80 mm. 5 examples.

10396, 10461, 10462. Tilig, Lubang Island. July 14, 1908. Length, 55–62 mm.

34 examples. Tumindao Island, Anchorage. February 25, 1908. Length, 49–86 mm.

27 examples. Veradero Bay, Luzon. July 22, 1908. Length, 21–58 mm.

1 example. Veradero Harbor, Luzon. July 22, 1908. Length, 21 mm. Damaged.

37 examples. Veradero Bay, Luzon. July 23, 1908. Length, 26–68 mm.

12933, 14343. Tobea Island. December 14, 1909. Length, 68 mm.

8 examples. Tomahu Island. December 11, 1909. Length, 25–39 mm.

4 examples. Tomahu Island. December 12, 1909. Length, 58–70 mm.

19892. Daisy Island, west of Bumbum. January 6, 1910. Length, 60 mm.

12 examples. Langao Point. June 24, 1909. Length, 57–68 mm.

4 examples. Maculabo Islands. June 14, 1909. Length, 53–75 mm.

20 examples. Powatik Harbor, Makyan Island. November 29, 1909. Length, 53–58 mm.

U.S.N.M. No. 51956. Negros, Philippines. Dr. Bashford Dean. Length, 38–40 mm., caudal ends broken. 2 examples. As *Sardinella clupeoides*.

U.S.N.M. No. 52028. Negros, Philippines. Dr. Bashford Dean. Length, 62 mm. As *Sardinella sirm*.

U.S.N.M. No. 52237. Apia, Samoa. Bureau of Fisheries (07546). Length, 31–50 mm. 12 examples.

U.S.N.M. No. 56062. Bacon, Philippines. Bureau of Fisheries (4009). Length, 38–52 mm. 37 examples.

U.S.N.M. No. 56254. Bulan, Philippines. Bureau of Fisheries (8756). Length, 43–66 mm. 5 examples.

U.S.N.M. No. 66042. Gilbert Islands. *Albatross* collection. 15 examples.

U.S.N.M. No. 66043. Arhno Atoll. *Albatross* collection. 49 examples.

U.S.N.M. No. 66044. Rangiroa, Paumotus. *Albatross* collection. 2 examples.

U.S.N.M. No. 83005. Tongatabu. Length 32 and 33 mm. 4 examples.

A.N.S.P. Bacon, Philippines. Bureau of Fisheries. Length, 50–62 mm. 7 examples.

STOLEPHORUS ALBURNUS (Kner)

Alausa alburnus KNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 54, p. 387, pl. 1, fig. 16, 1866 (type locality: "Valparaiso, Chile").—SCHMELTZ, Cat. Mus. Godeffroy, No. 4, p. 25, 1869 (Samoa).

Spratelloides alburnus SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 37, 1874 (Samoa); No. 7, p. 58, 1879 (Samoa).—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Samoa).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 384, 1909 (Samoa).

Stolephorus alburnus FOWLER, Mem. Bishop Mus., vol. 10, p. 29, 1928 (compiled); vol. 11, p. 315, 1931 (reference).

Depth 5⅓; head 3⅘. Snout 3⅖ in head from snout tip; eye 3⅖, equals snout; maxillary reaches front eye edge, length 2½ in head from snout tip; no teeth; interorbital ⅔ eye diameter, level.

Scales 36 in median lateral series to caudal base and 2 more on latter; 6 transversely, about 16 predorsal. Scales small on breast and at pectoral base. Fins, except caudal base, scaleless.

D. I, 11 (11 or 12 in description), second branched ray 1⅘ in total head length; A. 12 (11 or 12 in description), fin length 2; caudal 1⅖, little concave behind; least depth of caudal peduncle 3; pectoral 1¾; ventral 2¼.

Back dark, sides and below whitish, without silvery lateral band. Fins uniform. Length, 51 mm. (Kner.)

Samoa. Not seen since originally described.

STOLEPHORUS ROBUSTUS (Ogilby)

Spratelloides robustus Ogilby, Proc. Linn. Soc. New South Wales, vol. 22, p. 64, 1897 (type locality: "Coast of New South Wales" [=Maroubra]).

Stolephorus robustus Waite, Mem. New South Wales Nat. Club, No. 2, p. 12, 1904; Rec. Austral. Mus., vol. 6, pt. 3, p. 195, 1906 (Queenscliffe).—Ogilby, Ann. Queensland Mus., No. 9, p. 5, 1908 (Southport River); Commercial Fish. Fisher. Queensland, p. 47, 1915; Mem. Queensland Mus., vol. 5. p. 98, 1916 (South Queensland coast).—McCulloch, Rec. Austral. Mus., vol. 13, pt. 2, p. 42, pl. 11, fig. 1, 1920 (Sydney and Port Hacking; Bulwer, Queensland; Queenscliffe, Victoria; Tasmania).—Waite, Rec. South Austral. Mus., vol. 2, p. 38, fig. 55, 1921.—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—Whitley, Australian Zoologist, vol. 4, p. 228, 1926 (North West Islet, ejected by white-capped noddies).—McCulloch, Fishes of New South Wales, ed. 2, p. 16, pl. 4, fig. 51a, 1927.—Whitley, Rec. Australian Mus., vol. 16, p. 4, 1927 (Michaelmas Key, North West Islet, Moreton Bay; Port Hacking and Shellharbor, New South Wales; Queenscliffe; off Derwent River, Tasmania; types).—McCulloch, Australian Mus. Mem., vol. 5, p. 37, 1929 (reference).

Spratelloides delicatulus (not Bennett) Zietz, Trans. Roy. Soc. South Australia, vol. 32, p. 295, 1908.

Depth 5 to 5½; head 3¾ to 4⅕, width 2⅖ to 2¾. Snout 3⅓ to 3½ in head from snout tip; eye 3 to 3⅘, 1 to 1⅛ in snout, greater than interorbital; maxillary reaches ⅕ to ¼ in eye, expansion 2 to 2¼, length 2⅗ to 2⅞ in head from snout tip; no teeth; interorbital 4⅕ to 4¼, but slightly elevated, largely level, sides and top of head with some venules. Gill rakers 12+28, lanceolate, 1¼ in eye; gill filaments ⅔ gill rakers.

Scales 36 to 40 in median lateral series to caudal base and 3 or 4 more on latter, narrowly imbricated; 9 transversely, 14 predorsal. Axillary ventral scale half fin length. Scales with 1 or 2 transverse vertical striae, of which only one may be complete; circuli as parallel vertical close set striae, none apical.

D. II, 9, first branched ray 1⅖ to 1½ in total head length; A. II, 7, first branched ray 3⅕ to 3¼; caudal 1⅛ to 1⅕, moderately forked, lobes broad; least depth of caudal peduncle 2⅗ to 3⅛; pectoral 1⅗ to 1⅘; ventral 1⅔ to 1¾.

Back neutral dusky to brown, sides and below silvery white. Iris white. Dorsal and caudal pale brownish, lower fins whitish.

Queensland, New South Wales, Victoria, Tasmania.

U.S.N.M. No. 48824. Port Jackson. J. D. Ogilby. Length, 50–86 mm. 6 examples. Cotypes [paratypes]? of *Spratelloides robustus*.

STOLEPHORUS JAPONICUS (Houttuyn)

Atherina japonica HOUTTUYN, Verh. Holland. Maatsch. Haarlem, vol. 20, p. 340, 1782 (type locality: Japan).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1397, 1789 (Japan).—SCHNEIDER, Syst. Ichth. Bloch, p. 111, 1801 (copied).

Stolephorus japonicus LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 381, 382, 1803 (Japan).—JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 770, 1905 (Negros).—SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 462, 1906 (Susaki).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 629, 1906 (Wakanoura, Nagasaki, Heda, Osaka).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 403, 1912 (Nagasaki).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 184, 1920 (Tokyo market).—FOWLER, Mem. Bishop Mus., vol. 10, p. 30, 1928 (compiled); vol. 11, No. 5, p. 315, 1931 (reference).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 19, 1931 (Nagasaki).—HERRE, Field Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 33, 1936 (Tahiti).

Spratelloides japonicus MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—TANAKA, Jap. Fish. Life Colours, No. 47, 1933.

Engraulis commersonianus (not Lacépède) RICHARDSON, Ichth. China Japan, p. 308, 1846 (compiled).

Clupea gracilis SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 238, pl. 108, fig. 2, 1846 (type locality: Southeast coasts of Nagasaki).

Spratelloides gracilis BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 18, 1853; Atlas Ichth. Ind. Néerland., vol. 6, p. 96, pl. (8) 266, fig. 2, 1866–72 (Celebes and Ternate).—GÜNTHER, Cat. Fishes British Mus., vol. 6, p. 465, 1868 (Japan; type of *Clupea argyrotaenia*).—KLUNZINGER. Verh. zool.-bot. Ges. Wien, vol. 21, p. 601, 1871 (Red Sea).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 37, 1874 (Viti Levu).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 405, 1876 (Nagasaki).—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Viti Levu).—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Viti Levu).—OGILBY, Mem. Australian Mus., vol. 2, p. 72, 1889 (Lord Howe Island).—ISHIKAWA and MATSUURA, Prelim. Cat. Fish. Mus. Tokyo, p. 8, 1897.—STEINDACHNER, Abh. Senck. Ges., vol. 25, p. 456, 1900 (Ternate and Batjan).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 53, 1901 (southeast Japan).—BORSIERI, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 4, p. 218, 1904 (Nocra).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 384, 1909 (Fiji).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 20, fig. 12, 1913 (Kangeang Islands; Obi Major; Nusa Laut; Banda).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete).—HARDENBERG, Treubia, vol. 14, livr. 2, p. 215, 1933 (Temiang Island, Lingga Archipelago, Sumatra).—GRUVEL and CHABANAUD, Mém. Inst. Egypte, vol. 35, p. 4, 1937 (Gulf of Suez).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 23, 1937 (Dumaguete).

Stolephorus gracilis EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26, (1906), p. 53, 1907 (Bacon).—FOWLER, List Fish. Malaya, p. 24, 1938 (reference).

Clupea argyrotaeniata Bleeker, Journ. Indian Arch., vol. 3, p. 72, 1849 (type locality, Macassar, southwest Celebes).

Clupea argyrotaenia Regan, Trans. Zool. Soc. London, vol. 20, pt. 6, p. 276, 1914 (Mimika River, New Guinea).

Depth 6⅕ to 6½; head 4 to 4⅓, width 2½ to 3. Snout 3 to 3⅕ in head from snout tip; eye 3⅖ to 3⅘, 1⅛ to 1¼ in snout, ⅓ to ½ greater than interorbital; adipose lid rather narrow along hind eye edge; maxillary reaches ⅛ to ⅕ in eye, expansion 1½ to 1¾ in eye, length 2⅗ to 2⅔ in head from snout tip; no teeth; interorbital 5⅓ to 6¼, nearly level; sides and top of head venulose. Gill rakers 18+28, finely lanceolate, twice gill filaments or 1⅓ in eye.

Scales (pockets) 36 in median lateral series to caudal base and 4 more on latter; 8 scales transversely, 13 predorsal. Scales with 2 or 3 transverse radiating striae, often connected at middle of scale; circuli partly concentric, basal, none apical.

D. III, 11 or III, 10, first branched ray 1⅗ to 1⅔ in head; A. II, 12 or II, 11, first branched ray 4 to 4⅘; caudal 1⅓ to 1⅖, well forked, lobes pointed; least depth of caudal peduncle 3⅞ to 4; pectoral 1¾ to 1⅞; ventral 2 to 2⅛.

Back light brownish, under surfaces still paler. Side of head and iris silvery white. Broad silvery white lateral band, expanding over anal until wide as eye, its upper edge bounded all along by neutral gray line. Dorsal and caudal pale brownish, lower fins still paler to whitish.

Red Sea, East Indies, Philippines, Japan, Korea, Lord Howe Island, Polynesia.

7 examples. Bongao anchorage. Electric light. February 22, 1908. Length, 33–44 mm.

5 examples. Bulan Island, Sanalco Group. Electric light. September 13, 1909. Length, 35–54 mm.

7 examples. Busin Harbor, Burias Island. April 23, 1908. Length, 33–40 mm.

46 examples. Grande Island reef. Dynamite. January 8, 1908. Length, 23–48 mm.

19 examples. Isabella Basilan. September 11, 1909. Length, 40–68 mm.

3 examples. Jolo. Electric light. February 7, 1908. Length, 40–46 mm.

1 example. Lucena anchorage. Electric light. February 24, 1909. Length, 43 mm.

5 examples. Matnog Bay. Seine 150 feet. May 31, 1909. Length, 58–67 mm.

11 examples. Murcielagos Bay, Mindanao. August 21, 1909. From stomach of No. 9340. Length 45–57 mm. (?)

14 examples. Occidental Negros. January 22, 1909. Length, 52–58 mm.

204 examples. Philippines. Length, 38–55 mm.

144 examples. Port Matalvi, Luzon. November 23, 1908. Length, 33–57 mm.

27 examples. San Miguel Harbor, Ticao Island. April 21, 1908. Length, 31–53 mm.

1 example. Santa Cruz Island, Marinduque Island. April 24, 1908. Length, 34 mm.

4 examples. Tataan Island, Tawi Tawi Group. February 21, 1908. Length, 41–53 mm.

1 example. Tumindao Island anchorage. Electric light. February 26, 1908. Length, 40 mm.

5 examples. Varadero Bay, Mindoro. Electric light. July 22, 1908. Length, 26–37 mm.

6 examples. Varadero Bay. Electric light. July 23, 1908. Length, 25–52 mm.

U.S.N.M. No. 52019. Negros, Philippines. Dr. Bashford Bean. Length, 50–54 mm. 3 examples.

U.S.N.M. No. 56169. Bacon, Philippines. Bureau of Fisheries (3501). Length, 57 mm.

U.S.N.M. No. 59785. Susaki, Japan. Dr. H. M. Smith. Length, 77–78 mm. 2 examples.

U.S.N.M. No. 62342. Nagasaki, Japan. Jordan and Snyder. Length, 60–94 mm. 50 examples.

U.S.N.M. No. 70781. Kagoshima, Japan. *Albatross* collection 1906. Length, 79-94 mm. 10 examples.

U.S.N.M. No. 87648. Tahiti, Society Islands. J. M. Clements. Length, 33 mm.

STOLEPHORUS MADAGASCARIENSIS (Sauvage)

Spratelloides madagascariensis SAUVAGE, Bull. Soc. Philom. Paris, 1882, p. 160 (type locality: Madagascar); Hist. Nat. Madagascar, Poiss., p. 496, pl. 48, fig. 2, 1891 (type).

Spratelloides aestuarius GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 55, fig., 1913 (type locality: Zwartkops River, Port Elizabeth; tidal rivers East London; Princess Vlei, Cape Peninsula).—REGAN, Ann. Durban Mus., vol. 1, p. 167, 1916 (Durban).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 296, 1917 (reference).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 109, 1925 (False Bay, Port Elizabeth, East London, Natal).

Gilchristella aestuarius FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 365, fig. 4, 1935 (Blue lagoon, Natal).

Depth 5; head 3¾. Snout 3¾ in head from snout tip; eye 4, 1$\frac{1}{10}$ in snout; maxillary reaches front eye edge, length 2⅗ in head from snout tip; mandible apparently slightly protruded; interorbital low, scarcely elevated.

Scales 38 in median lateral series to caudal base and 2 more on latter; 9 transversely, about 19 predorsal.

D. III, 13, first branched ray 1⅓ in total head length, origin slightly behind ventral origin; A. 16 branched rays (description gives A. 19), fin length 1¼ in head, first branched ray 3½; caudal 3⅕ in combined head and body to caudal base, well forked, long lobes pointed; least depth of caudal peduncle 2⅞ in head; pectoral 1⅓; ventral 1⅞.

Brownish, broad silvery band from head to caudal. Length, 60 mm. (Sauvage.)

South Africa, Natal, Madagascar. Though I have identified the South African form with the present species the figure by Sauvage differs a little from his description. Possibly owing to an artist's mistake ?, the belly shows 9 preventral denticles and 7 postventral!

Barnard describes *Spratelloides aestuarius* with depth of body equal to length of head, 4 to 4⅕ in length, A. 18 to 21 and beginning under end of dorsal and ventral wholly in front of dorsal.

A.N.S.P., eight examples. Blue lagoon, in enclosed water. August 2, 1933. H. W. Bell-Marley. Length, 44–51 mm.

Genus DUSSUMIERIA Valenciennes

Dussumieria VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 467, 1847. (Type, *Dussumieria acuta* Valenciennes, monotypic.)

Body elongate, more or less compressed. Snout pointed. Eyes with very thin, wide, adipose lids. Jaws equal. Mouth bordered by very small premaxillary and maxillary, latter with 2 supplemental bones. Small teeth in jaws, in villiform patches on palatines, pterygoids and tongue, none on vomer. Gill membranes separate and free from isthmus. Pseudobranchiae large. Branchiostegals 15 to 20, very fine. Scales moderate, thin, very deciduous. Dorsal opposite ventrals, origin of fin nearer caudal than end of snout. Anal small, far behind dorsal.

Chabanaud has described and figured a fish which he refers to the present genus, though its entirely different appearance suggests the Atherinidae. This is seen in the elevated pectoral, the opposed posterior second dorsal and anal, and advanced ventral. The first dorsal is unique in that it is well premedian in the body, over the ventral, and composed of a spine and 5 branched rays. It may be found as follows:

DUSSUMIERIA PRODUCTISSIMA Chabanaud

Dussumieria productissima CHABANAUD, Bull. Inst. Océanogr. Monaco, No. 627, p. 4, fig. 3 (tongue), p. 4 (gill raker), pp. 5–6 (scales), 1933 (type locality: Gulf of Suez; Grand Lac Amer, Isthmus of Suez; Lac Timsah, Isthmus of Suez); Bull. Soc. Zool. France, vol. 58, p. 289, 1933 (above materials).—GRUVEL and CHABANAUD, Mém. Inst. Égypte, vol. 35, p. 3, fig. 3, 1937 (types).

Gruvel and Chabanaud say it is more elongate than *Dussumieria hasseltii* Bleeker, has more numerous gill rakers (29 to 34 in place of 19 to 24), also more numerous anal rays (17 to 19 in place of 16).

ANALYSIS OF SPECIES

*a*¹. Lateral scales 40 to 42 .... acuta
*a*². Lateral scales 52 to 56 .... hasseltii

DUSSUMIERIA ACUTA Valenciennes

Dussumieria acuta VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 467, pl. 606, 1847 (type locality: Bombay, Coromandel).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1268, 1849 (Pinang, Malay Peninsula, Singapore).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 145, 1851.—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 73, 1853 (reference).—KNER, Reise *Novara*, Fische, p. 330, 1865 (Java and Manila).—DAY, Fishes of Malabar, p. 226, 1865.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 466, 1868 (Sarawak and Pinang).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 94, pl. (13) 271, fig. 1, 1866–72 (Java, Sumatra, Pinang, Singapore, Bintang, Banka, Borneo, Celebes, Batjan, Amboina); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 275, 1868 (Obi Island); Nederland. Tijdschr. Dierk., vol. 4, p. 118, 1874 (Chinese drawing).—DAY, Fishes of India, pt. 4, p. 647, pl. 166, fig. 4, 1878 (Sind, India, Malabar).—BLEEKER, Verh. Akad. Wet. Amsterdam, vol 18, p. 3, 1879 (China).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, p. 278, 1884 (Hood Bay, New Guinea).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math. nat. kl., vol. 71, pt. 1, p. 157, 1907 (Gischin).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 590, 1912 (Pelaboen Ratoe, Java).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 3, 1913 (Macassar).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 21, fig. 13, 1913 (Batavia).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 62, p. 2, 1923 (Cebu).—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 481, 1924 (Singora).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1^e Note, p. 7, 1926 (Gulf of Siam).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 622, 1926 (Sarawak).—FOWLER, Mem. Bishop Mus., vol. 10, p. 30, 1928 (copied).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, No. 2, p. 355, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo Chine, 6^e Note, p. 122, 1929 (Cochin China).—DERANIYAGALA, Spoilia Zeylanica, vol. 15, p. 33, 1929.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 598, 1930 (Hong Kong); Hong Kong Nat., vol. 2, p. 113, 1931 (reference).—DERANIYAGALA, Ceylon Journ. Sci., vol. 5, p. 82, 1933.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, 1934 (Sanoer, Bali).—ROXAS, Philippine Journ. Sci., vol. 55, p. 251, pl. 1, fig. 5 (scale), 1934 (Orani; Manila).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 90, 1935 (Paknam; Bangkok); vol. 89, p. 130, 1937 (Paknam; Tachin).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 22, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 12, 1937 (reference).—FOWLER, List Fish. Malaya, p. 24, 1938 (reference).

Dussumieria elopsoides BLEEKER, Vehr. Batav. Genootsch. (Madura), vol. 22, p. 12, 1849 (type locality: Madura Straits near Kammal and Surabaya, Java); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 294, 1868 (Rio, Bitang), p. 300, 1868 (Waigiu).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 466, 1868 (type; part).

Depth 3⅞; head 3⅔, width 2⅖. Snout 3⅗ in head from snout tip; eye 3⅗, 1 in snout, greater than interorbital, adipose lids narrow and marginal; maxillary reaches ⅘ to snout, expansion 1¾ in eye, length 3$\frac{1}{10}$ in head from snout tip; no teeth; interorbital 4, but slightly elevated, level; side of head, occiput and humeral region venulose. Gill rakers 11+21, lanceolate, ⅞ of gill filaments or ½ in eye.

Scales (fallen) 48 in median lateral series to caudal base and 7 more on latter; 12 transversely, 23 predorsal. Scales with 5 transverse vertical complete striae and 6 short marginals basally; circuli as fine transverse vertical striae, none apical.

D. III, 12, first branched ray 1⅘ in head; A. III, 13, I, first branched ray 3⅕; caudal 1, deeply forked, lobes narrowly triangular; least depth of caudal peduncle 3; pectoral 1⅔; ventral 2⅕.

Back drab-brown, also occiput. Side of body, head, and under surface paler brown. Dorsal and caudal pale brown, lower fins whitish. Iris grayish.

Red Sea, India, Malay Peninsula, Singapore, Pinang, East Indies, Philippines, China.

2 examples. Jolo. Electric light. February 7, 1908. Length, 28 mm.
20158. Jolo market. February 11, 1908. Length, 84 mm.
1 example. Sebatic Island, Borneo. October 1, 1909. Length, 68 mm.
3 examples. Varadero Bay, Mindoro. July 23, 1908. Length, 21–23 mm.
1 example. Varadero Harbor. Electric light. July 22, 1908. Length, 40 mm.
1 example. D. 5561. September 19, 1909. Length, 18 mm.
U.S.N.M. No. 72494. Palaboean Ratoe, Wynkoops Bay, Java. October 1909. Bryant and Palmer. Length, 158 mm. Very poor specimen.
U.S.N.M. No. 84176. Philippine Islands. Dr. Fred Baker. Length, 140 mm.

DUSSUMIERIA HASSELTII Bleeker

Dussumieria hasseltii BLEEKER, Nat. Tijds. Nederland, Indië, vol. 1, p. 422, 1850 (type locality: Batavia, Cheribon, Samarang, Surabaya); Verh. Batav. Genootsch. (Chirocent.), vol. 24, p. 13, 1852; Atlas Ichth. Ind. Néerland., vol. 6, p. 95, pl. (13) 271, fig. 2, 1866–72 (Java, Madura, Sumatra, Singapore, Celebes, Batjan, Obi-major, Amboina).—DAY, Fishes of India, pt. 4, p. 647, pl. 166, fig. 5, 1878 (Canara, Coromandel); Fauna British India, Fishes, vol. 1, p. 399, 1889.—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27, 1907, p. 236, 1908 (Manila).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 590, 1912 (Batavia).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 23, 1913 (Batavia, Banjuwangi, Balikpapan, Lombok).—OGILBY, Mem. Queensland Mus., vol. 3, p. 134, 1915 (Cape York); vol. 5, p. 98, 1916 (Cape York).—FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines); Journ. Bombay Nat. Hist. Soc., vol. 30, No. 1, p. 39, 1924 (Calicut).—DELSMAN, Treubia, vol. 6, p. 297, 1925 (young).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 256, 1927 (San Fernando; Orani; Orion).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 71, p. 1, 1927 (Benkoelen, Sumatra).—MCCULLOCH, Australian Mus. Mem., vol. 5, p. 37, 1929 (Queensland).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e Note, p. 122, 1929 (Cochinchina).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 100, 1931 (Bagan Si Api Api).—FOWLER, Hong Kong Nat., vol. 2, p. 113, 1931 (reference).—CHEVEY, Inst. Océanogr. Indochine, 19^e Note, p. 8, 1932 (Cochin China).—HERRE, Fishes Herre Philippine Exped. 1931 p. 14, 1934 (Gulf of Lingayen; Unisan; La Paz; Cebu).—ROXAS, Philippine Journ. Sci., vol. 55, p. 252, pl. 1, fig. 2 (scale), 1934 (Luzon; Samar; Panay; Guimaras).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 22, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 12, 1937 (Singapore; near Malacca; Kuala Muda, Kedah).—FOWLER, List Fish. Malaya, p. 24, 1938 (reference).

Dussumieria hasselti WEBER, *Siboga* Exped., vol. 57, Fische, p. 3, 1913 (Saleyer.)—HORA and MUKERJI, Rec. Indian Mus., vol. 38, p. 18, 1936 (Maungmagan, Burma).

Dussumieria elopsoides (not Bleeker) GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 466, 1868 (part; Amboyna; Amoy).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 42, 1885 (Manila Bay).—ELERA, Cat. Fauna Filip., vol. 1, p. 584, 1895 (Luzon; Manila).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 328, 1902 (Kotosho).—DÜNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 186, 1904 (Kuala Lumpur).—FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang).—JORDAN and SEALE, Bull. Bur. Fisher., vol. 26, 1906, p. 5 (1907) (Cavite).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27, 1907 p. 236, 1908 (Iloilo); Mem., Carnegie Mus., vol. 4, p. 166, 1909 (copied Jordan and Evermann, 1902).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (Padang examples).

Elops javanicus (Kuhl and Van Hasselt) BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 95, 1866–72 (name in synonymy).

Dussumieria acuta (part) DAY, Fishes of India, pt. 4, p. 647, 1878 (copied).

Depth 5 to 5½; head 3¼ to 3¾, width 2⅖ to 2⅔. Snout 3 to 3$\frac{1}{10}$ in head from snout tip; eye 3⅗ to 3¾, 1⅛ to 1⅙ in snout, greater than interorbital, adipose lids moderate; maxillary not or quite reaches eye, expansion 3 to 3¼ in eye, length 3 to 3⅕ in head from snout tip; row of rather long, slender, uniform teeth in each jaw, also extend along each maxillary edge, on palatines and down tongue medially; interorbital 4 to 4⅔, broadly convex; opercle and sides of head smooth. Gill rakers 12+26, finely lanceolate, slender, longer than gill filaments or ½ of eye.

Scales 45 in median lateral series to caudal base and 4 more on latter; 12 scales transversely, 24 predorsal. Scales very caducous. Scales with 3 or 4 vertical parallel striae; 8 to 11 basal radiating striae and 15 to 20 apical marginal striae; circuli fine.

D. IV, 14, I to IV, 16, I, first branched ray 2 to 2⅕ in total head length; A. III, 12, I, first branched ray 4 to 6¼; caudal 1 to 1⅓, well forked, slender lobes pointed, equal; least depth of caudal peduncle 2⅞ to 3⅗; pectoral 2 to 2$\frac{1}{10}$; ventral 2⅕ to 2⅔.

Pale brownish, back dusky above, also dusky line from shoulder to caudal base medianly. Iris and side of head silvery white. Fins pale, dorsal lobes dusky terminally.

India, Malay Peninsula, Singapore, East Indies, Philippines, Formosa, China, Queensland.

U.S.N.M. No. 72495. Batavia, Java. Bryant and Palmer. 1909. Length, 147 mm.

U.S.N.M. No. 72496. Batavia, Java. Bryant and Palmer. 1909. Length, 82 mm.

U.S.N.M. No. 72497. Batavia, Java. Bryant and Palmer. 1909. Length, 90 mm.

U.S.N.M. No. 72498. Batavia, Java. Bryant and Palmer. 1909. Length, 89–118 mm. 7 examples.

2 examples. A.N.S.P. Calicut, India. James Hornell. Length, 95–97 mm.

1 example. A.N.S.P. Padang, Sumatra. A. C. Harrison and H. M. Hiller.

Length, 176 mm. When fresh in arrack faded, back bluish slaty, darker above, sides and lower surface silvery. Head mostly silvery. Fins pale, pectoral with rudimentary ray dusky at base.

The following young clupeids are likely the present species:

1 example. Balamban, Cebu. April 2, 1908. Length, 25 mm.
1 example. Busin Harbor, Burias Island. April 22, 1908. Length, 22 mm.
1 example. San Vicente Harbor, Luzon shore. November 13, 1908. Length, 27 mm.

Genus ETRUMEUS Bleeker

Etrumeus Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 58, 1853. (Type, *Clupea micropus* Schlegel, monotypic.)

Perkinsia Rosa Smith, Amer. Nat., Feb. 1891, p. 153. (Type, *Perkinsia othonops* Rosa Smith, monotypic.)

Montalbania Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 244, 1934. (Type, *Etrumeus albulina* Fowler, orthotypic.)

Body rather elongate, scarcely compressed. Eye entirely covered with adipose lids. Mouth moderately wide, terminal. Supplementary maxillary very rounded. Teeth sparse on maxillary and lower jaws; patches of villiform teeth on vomer, pterygoids and tongue. Gill rakers long. Pseudobranchiae present. Branchiostegals 15. Scales cycloid, entire, very deciduous. Anal rays 9 to 11, rays very short and low and last one slightly enlarged. Ventral entirely behind dorsal.

Species few, without a silvery lateral band.

ANALYSIS OF SPECIES

a^1. Montalbania. Body deeper, depth 4⅕ to 5; gill rakers 15+25; lateral scales 40 to 42 ---------- albulina

a^2. Etrumeus. Body more elongate, depth 5½ to 7; gill rakers 13 to 16+33 to 36; lateral scales 44 to 56 ---------- micropus

Subgenus Montalbania Fowler

Distinguished from subgenus *Etrumeus* by its deeper body, slightly larger scales and fewer gill rakers.

For Heraclio R. Montalban, in appreciation of his studies on Philippine fishes.

ETRUMEUS ALBULINA Fowler

Figure 14

Etrumeus albulina Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 244, fig. 7, 1934 (type locality: Iloilo, Philippines; East Indies).—Roxas and Martin, Dep. Agr. Comm. Manila Tech. Bull. 6, p. 23, 1937 (reference).

Depth 4¾ to 5; head 3⅓ to 3⅗, width 2½ to 2⅘. Snout 2⅞ to 3 in head measured from snout tip; eye 3 to 3⅗, 1⅛ to 1⅕ in snout, greater than interorbital; maxillary reaches ⅘ to ⅚ to eye, expansion 3 to 3½ in eye, length 2⅘ to 3⅕ in head from snout tip; teeth fine, simple, slender, uniserial in jaws, those on each side of mandible little larger; row of small fine teeth on each palatine, none on vomer; interorbital 4⅓ to 5, level; side and top of head, finely and rather feebly venulose. Gill rakers 15+25, finely lanceolate, ½ eye; gill filaments ¾ of gill rakers.

Scales very caducous, fallen from most all specimens, 40 to 42 (pockets) in median lateral series to caudal base and 3 or 4 more on latter; 15 or 16 transversely, 23 to 28 predorsal. Scales with basal half with 3 or 4 short, marginal, basal striae; apically without fine transverse parallel striae or circuli but membranous outer portion with 25 to 30 horizontal parallel fine marginal striae.

D. IV, 13, I or IV, 14, I, first branched ray 2 to 2⅛ in total head length; A, II. 11, I to II, 14, I, first branched ray 5½ to 6⅖; caudal 1 to 1⅛, deeply forked and lobes sharply pointed; least depth of caudal peduncle 3⅕ to 3¼; pectoral 1⅗ to 1¾; ventral 2¾ to 2⅘.

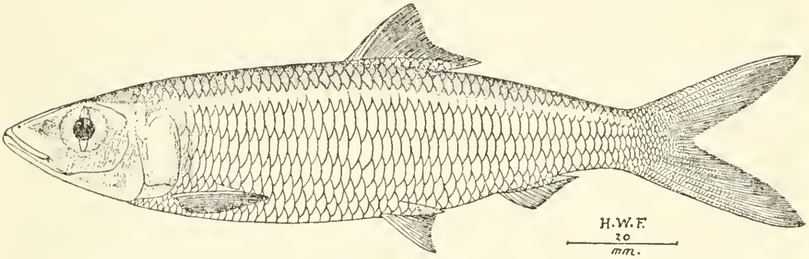

FIGURE 14.—*Etrumeus albulina* Fowler: Type (U.S.N.M. No. 93136).

Back uniform drab brown till level with upper eye edge, line of demarcation sharp from brilliant silvery white of body, sides of head and body. Snout rather pale brown, tip and mandible tip dusky. Dorsal and caudal pale brownish. Anal and paired fins whitish.

Differs from *Etrumeus micropus* in its deeper body, its depth 4 to 4½ compared with 5½ to 7 in the Japanese species, in which it approaches *Etrumeus jacksoniensis*, differing from both in about only 25 lower gill rakers.

U.S.N.M. No. 93136, Iloilo. Bureau of Fisheries (14150). Length, 150 mm. June 1, 1908. Type.

21931. Caiholo River, Ulugan Bay, Palawan. Length, 75–80 mm.

5954, 5956. Cavite market. September 4, 1909. Length, 68–88 mm.

5 examples. Cebu market. September 4, 1909. Length, 68–88 mm. [1904].

19404, 19407. Iloilo market. March 28, 1908. Length, 75–115 mm. 3 examples.

14150 to 14156. Iloilo market. June 1, 1908. Length, 128–150 mm. [Type No. 14150.] Paratypes.

5150 to 5152. Manila market, Luzon. December 12 to 18, 1907. Length, 137–142 mm.

22550 to 22553. Manila market. January 13, 1908. Length, 85–121 mm.

21930 and 21932. Manila market. April 16, 1909. Length, 130–136 mm.

9 examples. Manila market. April 20, 1909. Length, 86–142 mm. [1529].
21 examples. Sorsogon market. March 12, 1909. Length, 87–128 mm.
4 examples. Tacloban market. July 25, 1909. Length, 134–139 mm.
A 1017. Buka Buka Island, Gulf of Tomini, Celebes. November 20, 1909. Length, 140 mm.

Subgenus ETRUMEUS Bleeker

Body elongately fusiform, depth over 5, lower gill rakers over 30 and the lateral scales 44 or more.

ETRUMEUS MICROPUS (Schlegel)

Clupea micropus SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 236, pl. 107, fig. 2, 1846 (type locality: Southeast coast of Japan).

Etrumeus micropus BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. (18)48, 1853 (Nagasaki); (Japan), vol. 26, p. 5, 1857 (Nagasaki); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 3, p. 6, 1858 (Japan).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 467, 1868 (Japan).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 8, 1897.—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 53, 1901 (reference).—JENKINS, Bull. U. S. Fish Comm., vol. 22 (1902), p. 432, 1904 (Honolulu).—SNYDER, Bull. U. S. Fish Comm., vol. 22 (1902), p. 521, 1904 (Honolulu).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903), p. 58, 1905 (Honolulu).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 628, 1906 (Nagasaki, Wakanoura, Misaki, Aomori, Tokyo).—KISHINOUYE, Journ. Imp. Fisher. Bur. Tokyo, vol. 14, p. 100, pl. 18, fig. 1, 1907.—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 385, 1909 (Japan, Hawaii, California).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 268, 1908–11 (Natal).—FRANZ, Abh. Bayer. Akad. Wiss., vol. 4, Suppl. vol. 1, p. 5, 1910 (Yokohama; Aburatsubo).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (Honolulu).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 56, 1913 (Natal).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 295, 1917 (reference).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 184, 1920 (Tokyo market).—FOWLER, Copeia, No. 112, p. 82, 1922 (Hawaii).—FOWLER and BALL, Bishop Mus. Bull. 26, p. 5, 1925 (Lisiansky).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 108, 1925 (Port Elizabeth and Natal coast).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 120, 1925 (Misaki, Tokyo, Toba, Osaka, Kobe, Chosi).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan and Jinsen, Korea).—FOWLER, Mem. Bishop Mus., vol. 10, p. 29, 1928 (Honolulu, Hilo, Oahu).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 37, 1930 (Far East seas).—SCHMIDT, Bull. Acad. Sci. U. S. S. R., 1930, p. 108 (Nagasaki); Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 18, 1931 (Kagoshima).—TANAKA, Jap. Fish. Life Colours, No. 45, 1933.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, 1934, p. 410 (Natal).

Etrumeus jacksoniensis MACLEAY, Proc. Linn. Soc. New South Wales, vol. 3, p. 36, pl. 4, fig. 1, 1879 (type locality: Port Jackson); vol. 4, p. 382, 1880 (Sydney Harbor); vol. 6, p. 261, 1881 (reference).—OGILBY, Cat. Fishes New South Wales, p. 56, 1886 (copied).—MCCULLOCH, Rec. West. Australian Mus., vol 1, p. 211, pl. 29, 1914.—WAITE, Rec. South Australian Mus., vol. 2, No. 1, p. 36, fig. 51, 1921.—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 16, pl. 4, fig. 50a, 1927; Australian Mus. Mem., vol. 5, p. 37, 1929 (reference).

Etrumeus jacksoniensis OGILBY, Edible Fishes New South Wales, p. 186, 1893 (Port Jackson).

Perkinsia othonops ROSA SMITH, Amer. Nat., p. 153, Feb. 1891 (type locality: San Diego, Calif.).

Depth 5⅓ to 7; head 3¼ to 4⅖, width 1¾ to 3. Snout 3 to 3⅓ in head from snout tip; eye 3 to 4, 1⅕ to 1¼ in snout, greater than interorbital, adipose lid covers eye; maxillary reaches ⅞ or quite to eye, expansion 2¾ to 3 in eye, length 2½ to 3 in head from snout tip; teeth feeble, obsolete or very minute; interorbital 4 to 5½, little elevated, level medially; opercle smooth; cheek with numerous radiating venules. Gill rakers 14 to 16+33 to 35, slender, lanceolate, slightly longer than gill filaments or 1¾ to 2 of eye.

Scales (damaged) 47 to 55 in median lateral series to caudal base and 4 or 5 more on latter; 13 or 14 scales transversely at dorsal origin, 17 to 22 predorsal. Scales with 5 to 9 apical striae, also 2 to 4 above and same below but not connected; circuli parallel, convex, fine, none basally, none on apical half of scale.

D. III, 15, I or III, 16, I, first branched ray 1⅔ to 2 in total head length; A. III, 8, I, rarely III, 7, I, first branched ray 4⅞ to 6⅛; caudal 1⅕ to 1¼, deeply forked, lobes slender, pointed; least depth of caudal peduncle 3⅓ to 4; pectoral 1½ to 1⅞; ventral 3 to 3⅛.

Dusky lilac-brown on back, sides and below whitish. Iris white. Fins pale to whitish.

South Africa, Natal, West Australia, South Australia, New South Wales, Japan, Korea, California. I am unable to separate the Australian form on the single small specimen listed below.

U.S.N.M. No. 48815. Botany Bay, New South Wales. J. D. Ogilby. Length, 126 mm.

U.S.N.M. No. 44890. Japan. Japanese Government. Length, 233 to 243 mm., caudals broken. 3 examples.

U.S.N.M. No. 51029. Hawaiian Islands. U. S. Fish. Comm. (03596). Length, 235 mm.

U.S.N.M. No. 52695. Hawaiian Islands. U. S. Fish. Comm. (2770). Length, 248 mm.

U.S.N.M. No. 52775. Hawaiian Islands. U. S. Fish Comm. (03592). Length, 216 mm.

U.S.N.M. No. 55139. Honolulu. *Albatross* collection. Length, 208 mm., caudal ends broken.

U.S.N.M. No. 55441. Honolulu. Bureau of Fisheries (03115–03078). Length, 120–155 mm. 5 examples.

U.S.N.M. No. 55444. Honolulu. *Albatross* collection. Length, 31–110 mm. 21 examples.

U.S.N.M. No. 55553. Hawaiian Islands. Dr. O. P. Jenkins. Length, 233 mm.

U.S.N.M. No. 57628. Japan. P. L. Jouy. Length, 95–200 mm., caudal broken. In poor preservation.

U.S.N.M. No. 62329. Misaki. Jordan and Snyder. Length, 107–125 mm., caudal broken. 2 examples.

U.S.N.M. No. 82905. Oahu, Hawaiian Islands. U. S. Exploring Expedition. Length, 180 mm., caudal damaged.

U.S.N.M. No. 82906. Oahu, Hawaiian Islands. U. S. Exploring Expedition. Length, 150 mm., caudal damaged.

A.N.S.P. Nos. 28009 to 28013. Hawaiian Islands. Bureau of Fisheries. Length, 70–216 mm.

A.N.S.P. No. 28021. Hawaiian Islands. Bureau of Fisheries.

Family CLUPEIDAE

Body oblong or elongate, mostly compressed. Head usually compressed. Snout never prominent. Premaxillaries not protractile. Mouth rather large. Jaws usually nearly equal. Teeth small, feeble or absent. Hind lower part of opercular region often with angular emargination, tips of larger branchiostegals abruptly truncate. Gills 4, slit behind last. Gill membranes separate, free from isthmus. Branchiostegals 6 to 15. Pseudobranchiae present. Vertebrae 40 to 56. Ovaries with oviduct. Scales thin, loose, cycloid, sometimes pectinate. Belly rounded or compressed, always with bony serratures, with or without spines. Dorsal median or somewhat posterior, rarely absent. Anal usually somewhat long. Caudal forked. Ventrals moderate or small.

A large family found in all warm seas. Many of the species are noteworthy for their abundance in individuals.

ANALYSIS OF GENERA

- a^1. CLUPEINAE. Anal moderate, rays 15 to 25; jaws equal; ventrals well developed.
  - b^1. One continuous anal.
    - c^1. Predorsal without median row of scutes.
      - d^1. Dorsal origin before ventral origin.
        - e^1. Upper jaw without median notch.
          - f^1. Last 2 anal rays equal, not enlarged.
            - g^1. Vomer with patch of small persistent teeth; vertebrae 46 to 51. **Clupea**
            - g^2. Vomer without persistent teeth; vertebrae 39 to 44__ **Harengula**
          - f^2. Last 2 anal rays enlarged; transverse grooves on scales paired, their inner ends separated by interspace.
            - h^1. Opercle smooth, with obsolete or few if any striae_ **Sardinella**
            - h^2. Opercle with radiating striae well developed________**Arengus**
        - e^2. Upper jaw with distinct median notch.
          - i^1. Lateral scales 40 to 50, transversely 13 to 20____ **Macrura**
          - i^2. Lateral scales 75 to 100, transversely 27 to 34____ **Gudusia**
      - d^2. Dorsal origin behind ventral origin________________________ **Kowala**
    - c^2. Predorsal as well as abdomen with median row of scutes.
      - j^1. Premaxillaries little emarginate anteriorly; maxillary narrow; branchiostegals 8 or 9; dorsal insertion premedian ________________________________ **Potamalosa**
      - j^2. Premaxillaries moderately emarginate anteriorly; maxillary wide; branchiostegals 4; dorsal insertion median or postmedian________________________ **Hyperlophus**

b^2. Anal divided, second detached as 2 enlarged connected rays------ **Corica**

a^2. ODONTOGNATHINAE. Anal very long, with more than 30 rays; lower jaw prominent; ventrals small or absent.

k^1. Toothed bone between terminal end of premaxillary and middle of maxillary---------------------- **Pellona**

k^2. Ligament between terminal end of premaxillary and middle of maxillary.

l^1. Ventrals present---------------------------- **Ilisha**

l^2. No ventrals.

m^1. Dorsal present; maxillary broadly rounded behind, not extending beyond eye center-- **Opisthopterus**

m^2. Dorsal absent; maxillary tapers behind with age, extends to gill opening or beyond------ **Raconda**

Genus CLUPEA Linnaeus

Clupea LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 317, 1758. (Type, *Clupea harengus* Linnaeus, designated by Gill, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 35.)

Rogenia VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 248, 1847. (Type, *Rogenia alba* Valenciennes, monotypic.)

Uropterina LIOY, Atti Soc. Ital. Sci. Nat. Milano, vol. 8, p. 113, 1865. (Type, *Uropterina platyrhachis* Lioy, monotypic.) (Fossil.)

Maugeclupea WHITLEY, Rec. Australian Mus., vol. 18, p. 332, 1932. (Type, *Clupea bassensis* McCulloch, orthotypic.)

Body elongate, compressed. Maxillary reaches below anterior or middle part of eye. Lower jaw projects, upper not notched. Teeth minute, present or absent on vomer. Opercle smooth. Lower gill rakers 34 to 51. Scales 44 to 65 in medial lateral series, 12 to 16 transversely. Vertebrae 42 to 59. Dorsal rays 14 to 21, origin nearly median from snout tip and caudal base. Anal rays 14 to 23, last 2 not enlarged. Caudal forked, without enlarged scales. Ventral rays 7 to 10, inserted below or before middle of dorsal.

Species rather few and found in the cooler seas of the globe. In northern seas the individuals are often excessively numerous. Spawning marine.

The reference to *Clupea cultrata* in Journ. Asiat. Soc. Bengal, vol. 3, p. 367, 1834, is of uncertain identity. Called "Chalwa" and "The Jumna runs about three miles south of the village, the Ganges 14 miles north by east," the ground was "strewed with fish, in number not less than three or four thousand," evidently having fallen from a violent wind storm.

ANALYSIS OF SPECIES

a^1. Ventral rays 9 (rarely 8 or 10), origin behind dorsal origin; vomer toothed; preopercle broad as opercle; lower gill rakers 40 to 51; D. 17 to 20; A. 14 to 20; vertebrae 50 to 59-- **pallasii**

a^2. Ventral rays 8, origin nearly opposite dorsal origin; vomer toothless, seldom with minute teeth; opercle broader than preopercle; lower gill rakers 34 to 41; D. 15 to 19; A. 17 to 21; vertebrae 34 to 41.

b^1. Vomer toothed.
c^1. Depth 4¼; scales 48, transversely 13 or 14---------------- **antipodum**
c^2. Depth 3 to 3½; scales 43 or 44, transversely 10 or 11---------- **mülleri**
b^2. Vomer toothless.
d^1. A. 18 to 21.
e^1. Depth 3¼; scales 39 or 40---------------------------- **macrolepis**
e^2. Depth 4⅖ to 4⅘; scales 44, transversely 12------------ **bassensis**
d^2. A. 28 or 29; depth 3⅓---------------------------------- **schlegelii**

CLUPEA PALLASII Valenciennes

Clupea pallasii Valenciennes, Hist. Nat. Poiss., vol. 20, p. 253, 1847 (type locality: Kamtchatka).—Jordan and Herre, Proc. U. S. Nat. Mus., vol. 31, p. 630, fig. 4, 1906 (Aomori, Otaru, Matsushima, Kushiro, Same, Petropaulski).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (types of *Clupea mirabilis* and *Spratelloides bryoporus*).—Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Otaru; Fomokomai).—Jordan and Metz, Mem. Carnegie Mus., vol. 6, p. 6, fig. 5, 1913 (copied) (Fusan; Chinnampo).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 183, 1920 (Aomori).—Fraser, Contr. Canadian Biol. Toronto, No. 6, p. 9, 1921 (Biology).—Jordan and Hubbs, Mem. Carnegie Mus., vol. 10, p. 121, 1925 (Kushiro and Hakodate).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan and Genzan, Korea).

Clupea pallasi Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 53, 1901 (south to Nito).

Clupea harengus pallasi Soldatov and Lindberg, Bull. Pacific Soc. Fisher. Inst., vol. 5, p. 39, pl. 3, 1930 (Far East seas).—Taranetz, Bull. Pac. Sci. Inst. Fisher. Oceanogr., vol. 11, p. 54, fig. 32, 1937 (Far East seas).

Clupea harengus subsp. *pallasii* Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 20, 1931 (Fusan; Vladivostok).

Clupea mirabilis Girard, Proc. Acad. Nat. Sci. Philadelphia, 1854, pp. 138, 154 (type locality: San Francisco, Calif.); Rep. Pacific R. R. Surv., Zool., pt. 10, p. 329, 1858 (cotypes); p. 90, 1859 (cotypes).

Clupea inermis Basilewsky, Nouv. Mém. Soc. Nat. Moscou, vol. 10, p. 242, 1855 (type locality: Oriental Sea, Pekin, North China).—Günther, Cat. Fishes British Mus., vol. 7, p. 413, 1868 (copied).

Spratelloides bryoporus Cope, Proc. Amer. Philos. Soc., vol. 13, p. 25, 1873 (type locality: Sitka, Alaska).

Clupea harengus (not Linnaeus) Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, pp. 8, 9, 1897 (Sagalen).—Tanaka, Jap. Fish. Life Colours, No. 42, 1933.

Depth 3¾ to 4¾; head 3¼ to 4¾, width 2⅖ to 3⅕. Snout 3⅖ to 4 in head from upper jaw tip; eye 2½ to 5, 1 to 1½ in snout, greater than interorbital; maxillary reaches ⅖ to ½ in eye, expansion 1⅖ to 1½ in eye, length 2 to 2¼ in head from snout tip; no notch in front of upper jaw medially; jaws toothless except series of minute teeth along lower maxillary edge; narrow band of minute teeth on vomer, none on palatines; interorbital 3¼ to 5¾, slightly elevated, flat medially; opercle smooth. Gill rakers 18 to 20+35 to 43, slender, about ⅞ of eye; gill filaments ¾ of gill rakers.

Scales with 53 or 54 in median lateral series to caudal base and 4 or 5 more on latter; 13 or 14 transversely, 22 to 28 predorsal. Abdominal serrae 27 to 30+12 or 13. Ventral axillary flap 3/5 fin length. Opercle and cheek with radiating venules. Scales with 4 or 5 transverse marginal striae above, sometimes one or several may be complete with age; circuli all transversely parallel, very fine, none apical.

D. v, 13, i, or iv, 14, i, first branched ray 1 9/10 to 2 in total head length; A. iii, 13, i or iii, 14, i, first branched ray 4 to 4 1/8; caudal 4 1/3 to 4 1/2 in rest of body, forked; least depth of caudal peduncle 2 3/4 to 2 7/8 in total head length; pectoral 1 2/5 to 1 3/5; ventral 2 1/8 to 2 1/2.

Back brown to dusky olive above, sides and below silvery white. Dorsal and caudal dusted grayish, fins otherwise whitish.

China, Japan, Korea. Also north Pacific on coasts of North America.

U.S.N.M. No. 44889. Japan. Japanese Government. Length, 376–405 mm. 2 examples.

U.S.N.M. No. 48192. Otaru, Japan. S. Nozawa. Length, 195–305 mm. 3 examples.

U.S.N.M. No. 49452. Petropaulski Harbor, Kamtchatka. *Albatross* collection. August 13, 1896. Length, 149–185 mm. 5 examples.

U.S.N.M. No. 62340. Same, Riknoku, Japan. Jordan and Snyder. Length, 48–62 mm. 11 examples.

U.S.N.M. No. 71116. Hokkaido, Japan. *Albatross* collection. 1906. Length, 55–70 mm. 7 examples.

U.S.N.M. No. 77498. Tokyo market (Aomori), Japan. Jordan and Snyder, 1900. Length, 270 mm.

U.S.N.M. No. 82602. Hakodate, Japan. *Albatross* collection. Length, 60–108 mm. 8 examples.

A.N.S.P. Nos. 1319 and 1320. San Francisco, California. Dr. A. L. Heermann. Length, 175–184 mm. Cotypes of *Clupea mirabilis* Girard.

A.N.S.P. No. 1211. Sitka, Alaska. George Davidson. Length, 293 mm. Type of *Spratelloides bryoporus* Cope. In poor preservation.

CLUPEA ANTIPODUM (Hector)

Clupea sprattus var. *antipodum* Hector, Colonial Mus. Governm. Surv. Dept., (Fishes New Zealand), p. 133, 1872 (type locality: Beach in Foveaux Strait; near Wellington).

Clupea antipodum Waite, Rec. Canterbury Mus., vol. 1, No. 1, p. 10, 1907 (reference).—Regan, Ann. Mag. Hist., ser. 8, vol. 19, p. 227, 1917 (Stewart Island; type of *Clupea holodon*).

Amblygaster antipodus Waite, Rec. Canterbury Mus., vol. 1, No. 4, p. 317, 1912 (reference).

Clupea holodon Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 18, p. 5, 1916 (type locality: Stewart Island, New Zealand).

Depth 4 1/4; head 4 to 4 1/3. Eye 4 in head; maxillary reaches below front part of eye; elongate-ovate patch of teeth on vomer, broad ovate patch on tongue. Lower gill rakers 36.

Scales 48 in medial lateral series; 13 or 14 transversely; numerous radiating grooves at free edges of scales. Ventral scutes 21+12, keeled and pointed.

D. 16 or 17, origin little nearer caudal base than snout end; A. 16 to 18; caudal peduncle longer than deep; ventrals 8-rayed, inserted below dorsal origin; vertebrae probably not fewer than 46. Length, 150 mm. (Regan.)

New Zealand.

CLUPEA MÜLLERI Klunzinger

Clupea mülleri Klunzinger, Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, pt. 1, p. 416, 1879 (type locality: New Zealand).

Clupea muelleri Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 228, 1917 (Otago and Canterbury).

Depth 3 to 3⅓; head 3⅓ to 3½, width 2⅓ to 2½? Snout 3⅕ in head from snout tip; eye 3⅓, subequal with snout, greater than interorbital; maxillary reaches ⅓ in eye, expansion 1⅖ in eye, length 2 in head from snout tip; no teeth; interorbital 5, slightly concave. Gill rakers about 30 ?+37 ? finely lanceolate, equal eye; gill filaments about ⅖ gill rakers.

Scales about 36 ? in median lateral series to caudal base, narrowly imbricated; 8 ? between dorsal and ventral origins; about 17 predorsal forward to occiput. Abdominal serrae 22+8. Scales with 3 transverse conspicuous striae, of which 2 interrupted medially; circuli as close set parallel vertical striae.

D. III, 12, I ? (damaged), fin height about 1¾ ? in total head length; A. II, 14 ? (damaged), base length 1⅗; least depth of caudal peduncle 2½; pectoral 1⅗; ventral 2½.

Brown, discolored and apparently back little darker, now dark gray. Iris dark gray. Fins brown.

New Zealand. Regan mentions an elongate patch of teeth on vomer and ovate patch on tongue; lower gill rakers 36 to 39; scales 43 or 45, 10 or 11 transversely; ventral scutes 19 or 20+9 to 11; vertebrae, 42; length, 100 mm.

U.S.N.M. 39663. New Zealand. Otago University. Length, 89–90 mm., caudals broken. In very poor preservation.

CLUPEA MACROLEPIS Steindachner

Clupea macrolepis Steindachner, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 41, pt. 1, p. 13, 1879 (type locality: Townsville, Cleveland Bay, Queensland).—McCulloch, Australian Mus. Mem., vol. 5, p. 38, 1929 (reference).

Depth 3¼, body strongly compressed, upper profile less convex than lower; head over 4½, high as long. Snout 4 in head; eye nearly 3; mouth cleft small; mouth and palate toothless.

Scales 39 or 40 in median lateral series; 9 transversely. Caudal well scaled. Abdominal scutes 18+8, strong.

D. 17, origin eye diameter nearer snout tip than caudal base, height 1⅓ in head; A. 20 to 21 ?, begins behind end of dorsal base, equals dorsal height; lower caudal lobe eye diameter longer than head;

least depth of caudal peduncle 2½ in greatest body depth; pectoral scarcely half eye diameter shorter than head; ventral half of head, origin opposite dorsal origin.

Silvery band on back to caudal. Ends of caudal lobes dotted blackish. Length, 80 mm. (Steindachner.)

Queensland.

CLUPEA BASSENSIS McCulloch

Clupea (Pomolobus) bassensis McCulloch, Zool. Res. *Endeavour*, vol. 1, p. 16, pl. 4, fig. 3, 1911 (type locality: Bass Strait and Tasmania); Australian Mus. Mem., vol. 5, p. 38, 1929 (reference).

Clupea bassensis Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 18, p. 5, 1916 (Hobart).—Waite, Rec. South Australian Mus., vol. 2, p. 37, fig. 52, 1921.—Whitley, Pap. Proc. Roy. Soc. Tasmania, 1928, p. 45, 1929 (Tamar River, Launceston, Tasmania).

Maugeclupea bassensis Whitley, Rec. Australian Mus., vol. 18, p. 332, 1932 (reference).

Depth 4⅖ to 4⅘; head 3½ to 4. Snout 3 in head from snout tip; eye 3⅒ to 3⅗, subequal with snout, narrow adipose lid in front and behind; maxillary reaches ⅓ or nearly ½ in eye, expansion 2, length 2¼ in head from snout tip; few wide spaced microscopic teeth in front of each jaw; interorbital ⅔ of eye, flat.

Scales 44 in medial lateral series; 12 transversely; large and cycloid. Abdominal scutes 21+11.

D.18(iii, 14), first branched ray 2 in total head length; A. 18 to 20 (iii, 16), first branched ray 4⅖; caudal 1⅒, well emarginate; least depth of caudal peduncle 2⅘; pectoral 1½; ventral 2⅔.

Silvery, upper third of body dark blue. Scattered darker specks on jaws, preorbitals and caudal peduncle. Dorsal, caudal, and pectoral rays dark spotted. Length, 177 mm. (McCulloch.)

Scarcely distinct from *Clupea fuegensis* Jenyns, but vertebrae fewer (46 compared with 49 to 51). Scales 46 to 48 in medial lateral series, 12 to 14 transversely. Ventral fins inserted little in advance of dorsal origin. Length, 130 mm. (Regan.)

South Australia, Tasmania.

CLUPEA SCHLEGELII (Castelnau)

Meletta schlegelii Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 93, 1873 (type locality: Port Darwin).

Clupea sclegelii Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 259, 1881 (reference) (error).

Clupea schlegelii McCulloch, Australian Mus. Mem., vol. 5, p. 38, 1929 (reference).

Depth 3⅓, lower profile rather more convex than upper; head 4. Snout shorter than eye; eye 2¾ in head; maxillary reaches ⅓ in eye; lower jaw protrudes; minute teeth on palate, none on vomer; cheeks, opercles and preopercle finely striated.

Scales regularly arranged, rather firm, strongly striated, edges finely crenulated.

D. 19, end midway between snout and end of tail; A. 28 or 29; caudal deeply forked; pectoral rays 16, twice long as ventral; ventral origin opposite middle of dorsal.

Bright silvery, back light purple. Front part of head and fins yellow. Opercle gilt. Length, 77 mm. (Castelnau.)

Northern Australia.

Genus HARENGULA Valenciennes

Harengula VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 261, 1847. (Type, *Harengula latulus* Valenciennes=*Clupea macropthalma* Ranzani, designated by Gill, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 36.)

Clupalosa BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 12, 1849. (Type, *Clupalosa bulan* Bleeker, monotypic.)

Paralosa BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 111, 1866-72. (Type *Alausa melanura* (not *Clupea melanura* Cuvier) Valenciennes, monotypic.)

Lile JORDAN and EVERMANN, U. S. Nat. Mus., Bull. 47, pt. 1, p. 428, 1896. (Type, *Clupea stolifera* Jordan and Gilbert, monotypic.)

Wilkesina FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 63, p. 63, 1923. (Type, *Harengula fijiensis* Fowler and Bean, orthotypic.)

Herklotsella FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246. 1933. (Type, *Harengula dispilonotus* Bleeker, orthotypic.)

Body oblong or partly oblong, well compressed and body depth usually more than 3 in length. Edge of upper jaw without median notch. Dentition more or less complete, if so teeth present in jaws, on palatines, pterygoids and tongue; always absent from vomer. Vertebrae 39 to 44. Scales firmly adnate, thin. Dorsal with low scaly basal sheath. Abdominal scutes with distinct spines or smooth. Hind anal rays equal and transverse grooves of scales continuous.

Small firmly scaled sardines, related to *Sardinella* and *Sardina*, but most of the species smaller and with the last two anal rays not larger than those preceding. According to Regan's arrangement the American species fall within the subgenus *Harengula*, distinguished by the fewer lower gill rakers (27 to 33). *Lile* is here included as another subgenus with largely scaleless caudal and a well defined bluish lateral band. *Harengula dispilonotus* Bleeker is also placed in a distinct subgenus as it shows a strikingly different color pattern.

Doubtfully referred to this genus is the imperfectly described:

HARENGULA ABBREVIATA Valenciennes

Harengula abbreviata VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 296, 1847 (type locality: "New Holland").—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 413, 1868 (copied).

Sardinella abbreviata MCCULLOCH, Australian Mus. Mem., vol. 5, p. 38, 1929 (reference).

Depth slightly over 5 in total, body broad and thick set; head little shorter than body depth. Abdominal serrae very strong. Dorsal pointed, rays 19, A. 17. Caudal deeply forked. Pectoral pointed. Ventral inserted opposite fifth dorsal ray. Bluish or grayish on back, rest of body silvery. Tips of front dorsal rays black. Caudal gray. Length, 204 mm. (Valenciennes.)

Valenciennes says it was sent from New Holland by M. J. Verseaux, the last name evidently a misprint for Verreaux.

ANALYSIS OF SPECIES

a^1. HERKLOTSELLA. Back with 2 bluish saddlelike blotches; lower gill rakers 35;
    lateral scales 36 to 38 -- dispilonotus
a^2. Back without 2 black saddlelike blotches; 40 or more lateral scales.
  b^1. CLUPALOSA. Lower gill rakers 30 to 40.
    c^1. Depth $2\frac{7}{10}$; head $3\frac{1}{3}$; eye $2\frac{4}{7}$ in head ---------------------- maccullochi
    c^2. Depth $2\frac{2}{3}$; head $3\frac{2}{3}$; eye $2\frac{3}{4}$ in head -------------------- konigsbergeri
    c^3. Depth 3; head $3\frac{7}{8}$; eye $3\frac{1}{4}$ in head ---------------------------- bulan
    c^4. Depth $3\frac{1}{10}$; head $3\frac{4}{5}$; eye $2\frac{3}{4}$ in head ---------------------------- lippa
    c^5. Depth $3\frac{1}{3}$ to 4; head $3\frac{1}{3}$ to 4; eye 3 to $3\frac{1}{3}$ in head -------------- ovalis
    c^6. Depth 4 to $4\frac{1}{4}$; head 4 to $4\frac{2}{5}$; eye $3\frac{1}{2}$ to $3\frac{2}{3}$ in head ------ schrammii
  b^2. PARALOSA. Lower gill rakers 42 to 70.
    d^1. Depth $2\frac{1}{2}$ to $3\frac{1}{5}$; eye 3 in head; lower gill rakers 45 ------ castelnaui
    d^2. Depth 3 to 4; eye $3\frac{1}{3}$ to $3\frac{2}{3}$, in head.
      e^1. Lower gill rakers 50.
        f^1. Scales 38 to 48; dorsal with black spot at origin and apex black;
          tips and inner caudal edge black ---------------------- tawilis
        f^2. Scales 40 to 42; tips of caudal lobes blackish --------------- vittata
        f^3. Scales 44 to 46; caudal uniform -------------------------- zunasi
      e^2. Lower gill rakers 60 to 70; scales 40 -------------------- nymphaea
    d^3. Depth 4 to 5; eye $3\frac{1}{2}$ to $3\frac{7}{8}$ in head ---------------------- dollfusi

Subgenus HERKLOTSELLA Fowler

Back with 2 black saddlelike blotches. Lower gill rakers 35. Lateral scales 36 to 38.

HARENGULA DISPILONOTUS Bleeker

Harengula dispilonotus BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. (445) 456, 1852 (type locality: Banka).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 389, 1917 (type).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1933 (reference); vol. 86, p. 69 (Benoa; Sanoer, Bali), p. 86, 1934 (Sriracha).—HERRE, Fishes Herre Philippine Exped. 1931, p. 15, 1934 (Cebu).—ROXAS, Philippine Journ. Sci., vol. 55, p. 280, pl. 2, fig. 12 (scale), 1934 (Mindoro; Iloilo; Balabac).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 21, 1937 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 131, fig. 1, 1937 (Rayong, Siam).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 12, 1937 (Singapore).—FOWLER, List Fish. Malaya, p. 26, 1938 (reference).

Clupea dispilonotus GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 429, 1868 (type).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 9, 1913 (Kangeang Island).

Clupea (*Harengula*) *dispilonotus* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 111, pl. (3) 261, fig. 3, 1872 (Singapore, Banka, Bawean).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 60, 1913 (Kota Barn, Borneo; Kangean).—HARDENBERG, Treubia, vol. 14, livr. 2, p. 218, 1933 (Batavia).

Sardinella dispilonotus SUVATTI, Index Fish. Siam, p. 9, 1937 (reference).

Depth 2⅘ to 3; head 3½ to 3⅗, width 2⅛ to 2⅓. Snout 3½ to 3⅞ in head from snout tip; eye 3 to 3⅛, greater than snout or interorbital; maxillary reaches ¼ to ⅓ in eye, expansion 1⅗ to 1⅘, length 2⅕ to 2¼ in head from snout tip; teeth very minute, only those in front of mandible distinct; very fine teeth on palatines and tongue; interorbital 4 to 4¼, but very little convex or largely level medially; bones of cranium striate and side of head with radiating venules. Gill rakers 15 or 16+34 to 36, finely lanceolate, 1¼ in eye; gill filaments ⅗ of gill rakers.

Scales caducous, 35 to 37 (pockets) in median lateral series; 10 or 11 transversely; 10 or 11 predorsal. Abdominal serrae 14 or 15+11 to 13. Scales with 4 transverse or vertical striae; circuli as very fine transverse parallel striae, none apically where surface entire and without pits or pores.

D. III, 14, I or III, 15, I, first branched ray 1⅓ to 1⅖ in total head length; A. III, 13, I to III 16, I, first branched ray 4 to 4⅔; least depth of caudal peduncle 2⅖ to 2½; pectoral 1⅓ to 2⅖; ventral 1⅞ to 2; caudal 3⅛ to 3½ in rest of body.

Back and upper surface drab gray, sides and below silvery white. On back below last dorsal rays and black saddle-like spot on upper caudal peduncle behind depressed dorsal another similar, both blotches usually with gray or ocellated whitish ring. Dorsal and caudal grayish, lower fins whitish.

Singapore, East Indies, Philippines.

A very handsome little fish, the scales caducous, largely silvery white and strongly marked with the ocellated black saddlelike blotches on the back, a feature which immediately distinguishes it from all other Indo-Pacific clupeoids. It is rather indifferently figured by Bleeker, as the first black blotch appears lateral though in all my specimens it is dorsal on the back or as if the dorsal fin divides it in half. Furthermore, Bleeker's figure lacks much of the detail of the head.

2 examples. Catbalogan, Samar. April 15, 1908. Length, 104–106 mm.
17 examples. Tacloban market. July 25, 1908. Length, 74–85 mm.
4 examples. Sandakan Bay, Borneo. March 21, 1908. Length, 80–90 mm.
2 examples. Sandakan Bay. March 2, 1909. Length, 74–80 mm.

Subgenus CLUPALOSA Bleeker

Lower gill rakers 30 to 40. Back without black saddles.

HARENGULA MACCULLOCHI Whitley

Harengula maccullochi WHITLEY, Rec. Austral. Mus., vol. 18, p. 143, fig. 2, 1931 (type locality: Port Hedland, northwestern Australia).

Depth $2\frac{7}{10}$; head $3\frac{1}{3}$. Snout $3\frac{3}{4}$ in head from snout tip; eye $2\frac{4}{7}$, greatly exceeds snout, with broad adipose lids; maxillary reaches $\frac{2}{5}$ in eye, length $2\frac{1}{6}$ in head from snout tip; minute teeth on jaws and palatines, group of larger teeth on mandible anteriorly; vertex of head and to less extent opercles striated.

Scales less than 40 in lateral series; 12 transversely, predorsal 9; scapular area smooth, like most of head. Body scales large, deciduous, with margins striated or irregular, and subvertical lines mostly extending from top to bottom of each scale. Abdominal scutes 17 to 12.

D. 17, origin nearer snout tip than caudal peduncle, first branched ray $1\frac{2}{3}$ in total head length; A. 22, fin height 5, last rays not modified; caudal $3\frac{1}{8}$ in rest of fish; least depth of caudal peduncle $3\frac{1}{2}$ in total head; pectoral $2\frac{2}{7}$, nearly reaching ventral origin, rays 17; ventral rays 8, length $2\frac{2}{3}$ in total head length, origin below anterior half of dorsal.

General color silvery, dark grayish above. Some horizontal dusky bars and a row of 13 dusky spots along upper part of sides. Another row of 6 similar ones below upper anteriorly. Tips of snout, dorsal, and caudal lobes brownish.

Length, 127 mm. (Whitley.)

Western Australia. Said to be an ally of *Harengula konigsbergeri*, but with fewer predorsal scales and dorsal rays and more anal rays.

HARENGULA KONIGSBERGERI (Weber and Beaufort)

Clupea (*Harengula*) *konigsbergeri* WEBER and BEAUFORT, Verh. Akad. Wet. Amsterdam, vol. 17, p. 14, 1912 (type locality: Aru Islands); Fishes Indo-Australian Archipelago, vol. 2, p. 72, 1913 (type).

Harengula konigsbergeri REGAN, Ann. Mag. Nat. Hist. ser. 8, vol. 19, p. 390, 1917 (North West Australia and New Guinea).—FOWLER, Mem. Bishop Mus., vol. 10, p. 31, 1928 (compiled).

Harengula koningsbergeri McCULLOCH, Austral. Mus. Mem., vol. 5, p. 39, 1929 (reference).

Depth $2\frac{2}{3}$; head $3\frac{2}{3}$. Snout shorter than eye, which $2\frac{3}{4}$ in head; maxillary reaches $\frac{1}{3}$ in eye or little beyond. Lower gill rakers 33.

Scales 42 in medial lateral series; 12 transversely. Ventral scutes 17 or 18+11 or 12.

D. 18 or 19; A. 20 or 21; ventrals below or little before middle of dorsal. Length, 115 mm. (Regan.)

Northwest Australia, Aru Islands, New Guinea.

HARENGULA BULAN (Bleeker)

Clupalosa bulan Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 12, 1849 (type locality: Madura Strait near Bangcallang, Kammal and Surabaya, Java).

Clupea (*Harengula*) *bulan* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 111, 1866–72 (Java and Madura).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 73, 1913 (compiled).

Clupea bulan ? Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 619, 1926 (Sarawak).

Harengula bulan McCulloch, Austral. Mus. Mem., vol. 5, p. 39, 1929 (North Australia).

Clupea kowal (not Rüppell) Günther, Cat. Fishes British Mus., vol. 7, p. 450, 1868 (Zanzibar, Pinang, Amoy, type of *Clupalosa bulan*).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 599, 1871 (types).—Elera, Cat. Fauna Filip., vol. 1, p. 583, 1895 (Luzon, Cavite, Santa Cruz).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 7, 1897.

Clupea (*Clupalosa*) *kowal* Bleeker, Atlas Ichth. Ind. Néerland, vol. 6, pl. (8) 266, fig. 5, 1866–72.

Sardinella brachysoma (not Bleeker) Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang); Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 257, 1927 (Santa Maria, Orani, Orion).

Sardinella hypselosoma (not Bleeker) Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 489 (name only, on above); 1911, p. 206 (above materials).

Harengula argyrotaenia (not Bleeker) Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 591, 1912 (Batavia, Java).

Sardinella perforata (not Cantor) Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 382, 1917 (type of *Clupalosa bulan*).

Depth 3; head 3⅞, width 2½. Snout 4¼ in head from snout tip; eye 3¼, greater than snout or interorbital, adipose lids broadly covering eye; maxillary reaches ¼ in eye, expansion ½ eye, length 2⅛ in head from snout tip; no teeth, palate apparently edentulous; interorbital 4½, nearly level; cheeks venulose, radiating venules on opercle. Gill rakers 22+40, finely lanceolate.

Scales 34 in median lateral series to caudal base and 4 more on latter; 9 transversely, 15 predorsal. Abdominal serrae 18+11, edge very cultrate. Scales with 2 wide-set, transverse or vertical striae; circuli as fine parallel vertical striae basally, none apical.

D. iii, 13, first branched ray 1⅗ in total head length; A. iii, 16, first branched ray 3½; least depth of caudal peduncle 2¼; pectoral 1⅖; ventral 2; caudal 2⅘ in rest of body, forked.

Owing to formalin largely brown, faded, except slightly darker shading on back due to minute dusky dots, general appearance uniformly dull. Iris neutral gray or slate. Fins all uniformly brown, caudal with dusky shading terminally.

Red Sea, Zanzibar, India, Pinang, East Indies, Philippines, Amoy. The interesting specimen described above agrees with Bleeker's account of *Clupalosa bulan*, which was based on an example 145 mm. long and later figured as *Clupea* (*Clupalosa*) *kowal*. Bleeker gives abdominal serrae 30, though his figure showing 17+10 may have had more and D. IV, 15.

U.S.N.M. No. 72509. Batavia, Java. April 2, 1909. Bryant and Palmer. Length, 84 mm. As *Harengula argyrotaenia.*

A.N.S.P. Nos. 27437 and 27438. Padang, Sumatra. A. C. Harrison and H. L. Hiller. Length, 147–158 mm. As *Sardinella brachysoma* and *Sardinella hypselosoma.*

HARENGULA LIPPA Whitley

Harengula maccullochi WHITLEY, Rec. Austral. Mus., vol. 18, p. 143, fig. 2, 1931 (type locality: Port Hedland, Northwestern Australia).

Depth 3⅒; head 3⅘. Snout 3⅘ in head from snout tip; eye 2⅗, greater than snout, adipose lids broad; maxillary reaches ⅓ in eye, length 2⅓ in head from snout tip; minute teeth on jaws and palatines; vertex of head and to less extent, opercles striated.

Scales less than 40; 12 transversely; 11 predorsal. Scapular area smooth, like sides of head. Body covered with large striated scales with vertical lines interrupted in middle. Abdominal scutes 15+15.

D. 18, origin nearer snout tip than caudal peduncle, first branched ray 1¾ in total head length; A. 21, fin height 5, last rays not enlarged; caudal 3½ in rest of fish; least depth of caudal peduncle 2¾ in total head length; pectoral 1⅖, rays 17; ventral rays 8, fin 2⅓ in total head length, origin behind dorsal origin.

General color silvery, dark grayish above. Top of head, tips of jaws and lobes of dorsal and caudal dusky.

Length, 126 mm. (Whitley.)

Northwestern Australia. Said to be allied with *Harengula bulan*, differing notably in having more anal rays.

HARENGULA OVALIS (Bennett)

Clupea ovalis BENNETT, Mem. Life of Raffles, p. 690, 1830 (type locality: Sumatra).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 413, 1868 (copied).

Harengula ovalis FOWLER, List Fish. Malaya, p. 26, 1938 (reference).

Clupea punctata RÜPPELL, Neue Wirbelth., Fische, p. 78, pl. 21, fig. 2, 1835 (type locality: Red Sea).—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (South Seas).

Harengula punctata VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 297, 1847 (Massauah, Red Sea).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. (18)49, 1853 (Nagasaki); (Japan), vol. 26, p. 5, 1857 (Nagasaki); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 3, p. 6, 1858 (Japan).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 493, 1891 (reference).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 390, 1917 (Indo Pacific, East Africa, Paumotus).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 114, 1925 (Natal; Delagoa Bay).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—WHITLEY, Rec. Australian Mus., vol. 16, p. 4, 1927 (Michaelmas Cay, off Cairns, North Queensland; Giza; Solomons; and synonymy).—FOWLER, Mem. Bishop Mus., vol. 10, p. 31, 1928 (Fate; Shortland Island; Jaluit; Suva).—MCCULLOCH, Austral. Mus. Mem., vol. 5, p. 39, 1929 (reference).—FOWLER, Mem. Bishop

Mus., vol. 11, No. 5, p. 315, 1931 (reference).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 15, 1934 (Unisan; Culion; Dumaguete; Sitanki).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 411, 1934 (Natal).—HERRE, Mid-Pacific Mag., vol. 10, p. 163, No. 2, April–June 1935 (Pelew Islands).—GRUVEL and CHABANAUD, Mem. Inst. Egypte, vol. 35, p. 3, 1937 (Suez Canal).

Clupea quadrimaculata RÜPPELL, Neue Wirbelth., Fische, p. 78, pl. 21, fig. 3, 1835 (type locality: Massaua).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 601, 1871 (Red Sea).—BORSIERI, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 4, p. (197) 217, 1904 (Massaua; Daalac Island).

Sardinella lineolata VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 272, 1847 (type locality: Trinquemale, Ceylon; Buru).

Harengula bipunctata VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. (216) 298, 1847 (type locality: Massaua).

Clupea bipunctata (Ehrenberg) VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 298, 1847 (name in synonymy).

Harengula arabica VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 298, 1847 (type locality: Mohila).

Clupea arabica (Ehrenberg) VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 298, 1847 (name in synonymy).

Meletta obtusirostris VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. (276) 375, 1847 (type locality: Seychelles).

Meletta venenosa VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. (277) 377, 1847 (type locality: Seychelles).

Clupea venenosa GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 449, 1868 (Zanzibar).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 599, 1871 (Red Sea and Yokohama).—GÜNTHER, *in* Brenchley's Cruise of *Curaçoa*, p. 411, 1873 (Misol, Moluccas).—SCHMELTZ, Cat. Mus. Godeffroy, No. 8, p. 7, 1881 (Ponape).—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Ponape).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 42, 1885 (Rubi, New Guinea).—BOULENGER, Proc. Zool. Soc. London, p. 660, 1887 (Muscat).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, 1903, p. 186, 1904 (Singapore).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math-nat. Kl., vol. 71, pt. 1, p. 157, 1907 (Gischin, Bal Hâf, Ras Shoab).

Clupea (Harengula) venenosa WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 77, 1913 (compiled).

? *Alausa argyrochloris* VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 440, 1847 (type locality: Mauritius).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 413, 1868 (reference).

Alosa argyrochloris SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 527, 1891 (reference).

Harengula moluccensis BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 4, p. 609, 1853 (type locality: Ternate, Amboina, Ceram).—JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 770, 1905 (Negros).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 635, 1906 (Manila).—JORDAN and SEALE, Bull. Bur. Fisher., vol. 26 (1906), p. 4, 1907 (Cavite).—EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26 (1906), p. 53, 1907 (not Bacon; Bulan).—SEALE and BEAN, Proc. U. S. Nat. Mus., vol 33, p 239, 1907 (Zamboanga).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27 (1907), p. 236, 1908 (Manila).—SEALE, Philippine Journ. Sci., vol. A3, p. 514, 1908 (Manila Bay).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 62, p. 2, 1922 (Takao).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 178, 1931 (Kominato, Riu Kiu).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped., 1931, p. 15, 1934 (Jolo; Dumaguete).—ROXAS, Philippine Journ. Sci., vol. 55, p. 281, pl. 2, fig. 3 (scale), 1934 (Luzon; Panay; Palawan; Balabac; Camiguin; Mindanao; Bungau; Sitbutu).—HERRE, Field Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 31, 1936 (New Hebrides).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 22, 1937 (reference).

Clupea moluccensis GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 427, 1868 (type; Ceylon).—CASTELNAU, Proc. Linn. Soc. New South Wales, vol. 3, p. 395, 1879 (Port Jackson; Brisbane).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 376, 1880 (copied).—GÜNTHER, Rep. Voy. *Challenger*, vol. 1, p. 57, 1880 (Nares Harbor, Admiralty Islands).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 259, 1881 (reference).—OGILBY, Cat. Fishes New South Wales, p. 56, 1886.—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 8, 1897.—WEBER, *Siboga* Exped., Fische, vol. 57, Fische, p. 9, 1913 (Obi Major).—BAMBER, Journ. Linn. Soc. London, vol. 31, Zool., p. 478, 1915 (Sudanese Red Sea).

Clupea (*Harengula*) *moluccensis* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 107, pl. (5)263, figs. 1-2, 1868-72 (Sumatra, Nias, Singapore, Bali, Sumbawa, Celebes, Ternate, Batjan, Buru, Amboina, Sapurua, Ceram, Timor).—BEAUFORT, Bijdr. Dierk. Amsterdam, vol. 19, p. 97, 1913 (Saonek).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 81, fig. 28 (scale), 1913 (Nias, Pulu Weh, Ceram, Ambon, Waigiu, Kei Islands).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1^{e} Note, p. 8, 1926 (Annam coast).—DELSMAN, Treubia, vol. 8, p. 218, foot note, 1926.—DERANIYAGALA, Spolia Zeylanica, vol. 15, p. 43, 1929.

Sardinella moluccensis COCKERELL, Mem. Queensland Mus., vol. 3, p. 36, 1915 (scales).

Harengula kunzei BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 12, p. 209, 1856 (type locality: Ternate); vol. 15, p. 221, 1858 (Biliton).—DAY, Fauna Brit. India, Fishes, vol. 1, p. 372, 1889.—KENDALL and GOLDSBOROUGH, Mem. Mus. Comp. Zool., vol. 26, p. 243, 1911 (Jaluit, Marshall Group; Suva, Fiji).

Clupea (*Harengula*) *kunzei* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 107, pl. (5) 263, fig. 1, 1866–72 (Amboina).

Clupea kunzei DAY, Fishes of India, pt. 4, p. 636, pl. 163, fig. 1, 1878 (Ceylon, Andamans, Nicobars).

Sardinella kunzei SEALE, Occ. Pap. Bishop Mus., vol. 4, No. 1, p. 5, 1906 (Faté; Shortland Island).—McCULLOCH, Rec. Australian Mus., vol. 9, pt. 3, p. 355, fig. 55, 1913 (Murray Island).

Clupea kunzii GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 382, 1909 (compiled).

Harengula spilura GUICHENOT, Notes le Réunion, vol. 2, p. 16, 1863 (type locality: Bourbon).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 413, 1868 (copied).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 493, pl. 48, fig. 3, 1891 (Réunion and Madagascar).

Clupea (*Harengula*) *dubia* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 108, 1866–72 (copied Valenciennes).

Spratelloides delicatulus (not Bennett) ALLEYNE and MACLEAY, Proc. Linn. Soc. New South Wales, vol. 1, p. 350, 1877 (Darnley Island).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 381, 1880 (Darnley Island).

Clupea profundis KENT, Prelim. Rep. Food Fish Queensland, p. 11, 1889 (type locality: Queensland) (name only); Great Barrier Reef, p. 370, 1893 (reference).

Clupea torresiensis (De Vis) Kent, Prelim. Rep. Food Fish Queensland, p. 11, 1889 (type locality: Queensland) (name only); Great Barrier Reef, p. 370, 1893 (reference).

Clupea ranelayi (DeVis) Kent, Prelim. Rep. Food Fish Queensland, p. 11, 1889 (type locality: Queensland) (name only); Great Barrier Reef, p. 370, 1893 (reference).

Harengula stereolepis Ogilby, Proc. Linn. Soc. New South Wales, vol. 22, p. 759, 1897 (type locality: Torres Straits; Darnley Island; Southeast New Guinea).

Harengula punctata stereolepis Whitley, Rec. Australian Mus., vol. 18, p. 332, 1932 (reference).

Sardinella stereolepis Giltay, Mem. Mus. Roy. Nat. Hist. Belg., ser. 5, vol. 3, p. 16, fig. 7 (scale), 1933 (Pisang Island).

Clupea mizun Kishinouye, Journ. Imper. Fisher. Bur., Tokyo, vol. 14, p. 98, pl. 20, fig. 3, 1907 (type locality: Kiu Kiu Islands, Japan).

Depth $3\frac{4}{5}$ to $4\frac{1}{8}$; head $3\frac{1}{2}$ to $3\frac{2}{3}$, width $2\frac{1}{8}$ to $2\frac{1}{5}$. Snout $3\frac{1}{3}$ to $3\frac{3}{5}$ in head from snout tip; eye 3 to $3\frac{2}{5}$, equals snout, greater than interorbital, adipose lid covers hind third of eye; maxillary reaches $\frac{1}{5}$ to $\frac{1}{4}$ in eye, expansion $1\frac{1}{2}$ to $1\frac{3}{5}$ in eye, 2 to $2\frac{1}{10}$ in head from snout tip; interorbital $4\frac{1}{5}$ to $4\frac{3}{5}$, little elevated, level; cheek, preopercle and opercle with radiating venules. Head above and humeral region papillate to somewhat venulose. Gill rakers 14+31 or 32, finely lanceolate, $\frac{7}{8}$ of gill filaments, which $1\frac{4}{5}$ in eye.

Scales 43 or 44 in median lateral series to caudal base; 10 or 11 transversely, 14 predorsal. Abdominal serrae 18+13 or 14. Scales with 5 or 6 vertical striae, sometimes 2 or 3 more incomplete marginals.

D. iv, 14, i, first branched ray $1\frac{3}{5}$ to $1\frac{3}{4}$ in total head length; A. ii, 14, i, to 16, i, first branched ray 4 to $4\frac{1}{10}$; caudal $1\frac{1}{8}$ to $1\frac{1}{3}$, deeply forked and lobes pointed; least depth of caudal peduncle 3 to $3\frac{1}{3}$; pectoral $1\frac{2}{5}$ to $1\frac{3}{5}$; ventral $1\frac{3}{5}$ to $2\frac{1}{8}$.

Back steel to gray-blue or neutral gray. Under surface of head gray-brown. Sides and under surface of body silvery white. Dorsal and caudal with gray-brown tints. Lower fins whitish.

Red Sea, Arabia, Zanzibar, Madagascar, Seychelles, Ceylon, India, Andamans, Nicobars, Singapore, East Indies, Philippines, Formosa, Japan, Queensland, New South Wales, Melanesia, Micronesia, Polynesia.

Clupea ovalis Bennett may have been intended for this species, at least to judge from the short diagnosis:

Body oval. Dorsal rays 18, median, anteriorly elevated. Anal 17. Caudal 18? Pectoral 15. Ventral 7. A black humeral blotch.

The imperfect account of *Alausa argyrochloris* may refer to the present species:

Snout pointed. D. 17, A. 19. Back, dorsal and caudal greenish, rest of body silvery. Small blackish dot at base of first dorsal ray. Length 153 mm.

24143. Alimango Bay, Burias Island. March 6, 1909. Length, 138 mm.
7 examples. Batangas market. June 6, 1908. Length, 71–94 mm.
20407. Batangas market. June 7, 1908. Length, 8 mm.
22049. Batauanan Island. June 13, 1909. Length, 91 mm.
20078. Blackwater ponds Putoc River, Mindanao. January 30, 1909. Length, 73 mm.
1 example. Busin Harbor, Burias Island. April 22, 1908. Length, 35 mm.
1 example. Catbalogan, Samar. April 16, 1908. Length, 76 mm.
22317. Cebu. March 13, 1909. Length, 118 mm.
1 example. Cebu market. March 20, 1909. Length, 83 mm.
21965. Cuyo Island. April 9, 1909. Length, 80 mm.
3 examples. East side Tagbilaran Strait, Bohol Island. April 9, 1908. Length, 76–79 mm.
3 examples. Gomomo Island. December 3, 1909. Length, 68–95 mm.
20508. Guijulugan Beach, Negros. April 2, 1908. Length, 108 mm.
1 example. Hinunangan Bay, Leyte. July 30, 1909. Length, 63 mm.
1 example. Languilidlid, Cavite, Luzon. Length, 95 mm.
2 examples. Los Amigos, Tawi Tawi. February 18, 1908. Length, 54–56 mm.
1 example. Manila Bay. December 8, 1909. Length, 55 mm.
1 example. Matnog Bay. May 31, 1909. Length, 50 mm.
34 examples. Nasugbu, Luzon. January 16, 1908. Length, 30–54 mm.
2 examples. Nasugbu. January 21, 1908. Length, 34 or 35 mm.
1 example. Port Jamelo, Luzon. July 13, 1908. Length, 40 mm.
1 example. San Miguel Harbor, Ticao Island. April 21, 1908. Length, 50 mm.
17558. Sorsogon market. March 12, 1909. Length, 86 mm.
18 examples. Varadero Harbor, Mindoro. July 22, 1908. Length, 27–34 mm.
3 examples. Varadero Bay. July 23, 1908. Length 25–52 mm.
20403. Verde del Sur Island, Palawan reef and sand flats. April 6, 1909. Length, 81 mm.
13317, 13322 to 13324. Amboina market. December 7, 1909. Length, 140–146 mm.
2 examples. Tifu Bay, Bouro Island. December 10, 1909. Length, 88–93 mm.
U.S.N.M. No. 52010. Negros. Dr. Bashford Dean. Length, 43 mm., caudal broken. As *Harengula moluccensis*.
U.S.N.M. No. 57940. Zamboanga, Mindanao. August 21, 1906. Dr. E. A. Mearns. Length, 42 mm. As *Harengula moluccensis*.
U.S.N.M. No. 65857. Jaluit, Marshalls. *Albatross* collection. 1900. Length, 72–110 mm. 2 examples.
U.S.N.M. No. 65858. Suva, Fiji. *Albatross* collection. 1899–1900. Length, 28–32 mm. 63 examples, all young.
U.S.N.M. No. 75892. Tandjong Setabal, Borneo. March 23, 1913. H. C. Raven. Length, 104–125 mm. 5 examples.
U.S.N.M. No. 76605. Formosa. Dr. Fred Baker. Length 54–119 mm. Scales all fallen. As *Harengula moluccensis*.
3 examples. A.N.S.P. Calicut, India. James Hornell. Length, 97–111 mm.

HARENGULA SCHRAMMII (Bleeker)

Alausa schrammii Bleeker, Verh. Batav. Genootsch. (Bali), vol. 22, p. 11, 1849 (type locality: Boleling, Bali).

Meletta schrammi Günther, Cat. Fishes British Mus., vol. 7, p. 412, 1868 (copied).

Clupea (*Meletta*) *schrammi* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, pl. (14)272, fig. 3, 1866–72.

Clupea (*Harengula*) *schrammi* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 109, 1866–72 (Bali).—Weber and Beaufort, Fishes Indo-Austral. Archipelago, vol. 2, p. 83, 1913 (Ambon; Batjan).—Chabanaud, Service Océanogr. Pêches Indo-Chine, 1e Note, p. 9, 1926 (Poula Condore).

Harengula schrammi Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 391, 1917 (type; Misol; Goram).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 257, 1927 (Santa Maria; Vigan; San Fernando).—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fish. Herre Philippine Exped. 1931, p. 15, 1934 (Dumaguete).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, fig. 3, 1934 (Den Pasar; Sanoer, Bali).

Sardinella schrammi Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 21, 1937 (reference).

Clupea venenosa (not Valenciennes) Steindachner, Abh. Senck. Ges., vol. 25, p. 456, 1901 (Batjan).

Depth 4⅕ to 4⅗; head 3⅘ to 3⅞, width 2⅕ to 2⅖. Snout 3 to 3⅖ in head from snout tip; eye 3⅓ to 3⅔, subequal with snout, greater than interorbital; maxillary reaches ⅓ to ⅖ in eye, expansion 1⅓ to 1⅖ in eye, length 2⅛ to 2¼ in head from snout tip; no teeth; interorbital 5 to 6, nearly level; head above and laterally largely venulose, also humeral region. Gill rakers 16+28, lanceolate, 1¾ in eye.

Scales 41 or 42 in medial lateral series to caudal base; 8 transversely, 13 predorsal to occiput. Scales with 3 or 4 complete, vertical, parallel striae; apical ends feebly crenulated, smooth.

D. iii, 14, i, seventh branched ray 1⅗ to 1⅘ in total head length; A. ii, 15, i, or ii, 16, i, first branched ray 3 to 4¼; caudal 1⅒ to 1⅛, forked; least depth of caudal peduncle 2½ to 2⅘; pectoral 1½ to 1⅗; ventral 2¼ to 2½.

Back olivaceous, silvery white below. Dorsal and caudal gray, little darker terminally. Anal and paired fins whitish. Jaws tipped dusky.

East Indies, Philippines.

2 examples. A.N.S.P. Santa Maria, Ilocos Sur, Luzon. Rev. Joseph Clemens. Purchased.

13 examples. A.N.S.P. Vigan, Ilocos Sur, Luzon. Rev. Joseph Clemens. Purchased.

2 examples. A.N.S.P. San Fernando, Union, Luzon. Rev. Joseph Clemens. Purchased.

Subgenus Paralosa Bleeker

Lower gill rakers 42 to 70. Back without black saddles.

HARENGULA CASTELNAUI (Ogilby)

Kowala castelnaui Ogilby, Proc. Linn. Soc. New South Wales, vol. 22, p. 66, 1897 (type locality: New South Wales).

Sardinella castelnaui Stead, Edible Fishes New South Wales, p. 26, pl. 5, 1908.—Ogilby, Commerc. Fish. Fisher. Queensland, p. 47, 1915.—Roughley, Fishes of Australia, p. 15, 1916 (New South Wales, South Queensland).

Harengula castelnaui REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 391, 1917 (New South Wales).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 17, pl. 5, fig. 55a, 1927; Austral. Mus. Mem., vol. 5, p. 39, 1929 (reference).

Clupea hypselosoma (not Bleeker) KLUNZINGER. Sitzungsber, Akad. Wiss., Wien, math.-nat. Cl., vol. 80, p. 416, 1880 (Queensland).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 375, 1880 (Port Jackson).—OGILBY, Cat. Fishes New South Wales, p. 56, 1886.—KENT, Great Barrier Reef, pp. 302, 370, 1893.

Clupea sundaica (not Bleeker) MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 373, 1880 (Elizabeth Bay, Sydney); vol. 6, p. 259, 1881 (Port Jackson, Hawkesbury River).—WOODS, Fish Fisher. New South Wales, p. 86, 1882.—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, 1883, p. 209, 1884 (Lower Burdekin River).—OGILBY, Edible Fishes New South Wales, p. 182, 1893.—KENT, Great Barrier Reef, p. 301 (Torres Straits), p. 370, 1893.

Depth 2¾ to 2⅞; head 3⅗ to 3⅘, width 2 to 2$\frac{1}{10}$. Snout 2⅘ to 3⅔ in head from snout tip; eye 2⅞ to 3, greater than snout or interorbital, broad adipose lids cover last third of eye; maxillary reaches ⅖ to ½ in eye, expansion 1⅘ to 2 in eye, length 2 to 2$\frac{1}{10}$ in head from snout tip; few weak, obsolete teeth along jaw edge; interorbital 4½ to 5¼, scarcely elevated, largely level; cheek, side of head, humeral and occipital regions with venules. Gill rakers 18+52, finely lanceolate, equal gill filaments or ½ of eye.

Scales (mostly fallen) 30 or 31 in median lateral series to caudal base and 4 or 5 more on latter; 13 transversely, 12 or 13 predorsal. Abdominal serrae 17+11. Scales with 4 or 5 complete, well-separated or vertically parallel striae; circuli all finely vertically parallel, none apical.

D. III, 14, I, first branched ray 1⅖ to 1½ in total head length; A. II, 17, I, first branched ray 3½ to 4; least depth of caudal peduncle 2¼ to 2⅖; pectoral 1¼ to 1⅓; ventral 2; caudal 2⅔ to 2⅘ in rest of body, deeply forked, long lobes slender and pointed.

Back and upper surface of head brown. Sides and lower surface of body bright silvery white. Iris whitish. Dorsal, caudal, and pectoral brownish, first with narrow blackish apex. Ventrals and anal pale.

Queensland, New South Wales.

U.S.N.M. No. 48801. Port Jackson, New South Wales. J. D. Ogilby. Length, 188–200 mm. Paratypes of *Kowala castelnaui*. 2 examples.

U.S.N.M. No. 59944. Port Jackson. D. G. Stead. Length, 183–185 mm. 2 examples.

U.S.N.M. No. 59945. New South Wales. D. G. Stead. Length, 90–175 mm. 9 examples.

HARENGULA TAWILIS Herre

Harengula tawilis Herre, Philippine Journ. Sci., vol. 30, No. 3, p. 273, pl. 1, 1927 (type locality: Lake Taal, Bombon); vol. 34, p. 296, 1927 (Luzon; Mindoro); Fishes Herre Philippine Exped. 1931, p. 15, 1934 (Lake Bombon).—Roxas, Philippine Journ. Sci., vol. 55, No. 3, p. 282, pl. 2, fig. 15 (scale), 1934 (Lake Taal).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 22, 1937 (reference).

Depth 3 to $3\frac{1}{2}$; head $3\frac{1}{2}$ to $3\frac{9}{10}$. Snout $6\frac{3}{5}$ to $7\frac{1}{4}$ in head; eye $3\frac{1}{5}$ to $3\frac{2}{3}$, greater than snout; maxillary reaches $\frac{2}{5}$ in eye, expansion $1\frac{1}{2}$ in eye, length $2\frac{1}{5}$ to $2\frac{2}{5}$ in head; teeth obsolete, rarely present in upper jaw, usually in lower jaw, on palatines, pterygoids and tongue; 5 to 7 or more longitudinal striae on top of head behind interorbital. Gill rakers 35 to 37+50 to 60.

Scales 38 to 40 in medial lateral series; 11 or 12 transversely. Abdominal scutes 18+12.

D. 17 or 18, first branched ray $1\frac{1}{3}$ in head; A. 19 to 21, base subequal or greater than dorsal base, first branched ray $4\frac{1}{4}$; caudal $3\frac{1}{2}$ in rest of body, well forked; least depth of caudal peduncle $2\frac{1}{2}$ in head; pectoral $1\frac{1}{3}$ to $1\frac{2}{5}$; ventral $2\frac{1}{4}$.

Metallic steel blue, with silvery luster along back, shining silver elsewhere. Tips and inner edges of caudal blackish. First dorsal butter yellow, black spot at origin and upper half thickly specked with black or black spot above anteriorly. Other fins colorless. Pectoral with fine black line along upper edge. Length, 128 mm. (Herre.)

Lake Taal, Luzon, in fresh water.

HARENGULA VITTATA (Valenciennes)

Clupeonia vittata Valenciennes, Hist. Nat. Poiss., vol. 20, p. 352, 1847 (type locality: Vanikoro).

Harengula vittata Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 392, 1917 (Celebes and Raiatea).—Fowler, Mem. Bishop Mus., vol. 10, p. 31, 1928 (copied).—Whitley, Journ. Pan Pacific Inst., vol. 3, No. 1, p. 11, 1928 (Santa Cruz Islands).—Fowler, Mem. Bishop Mus., vol. 11, No. 5, p. 315, 1931 (reference).

Alausa melanura (not *Clupea melanura* Cuvier) Valenciennes, Hist. Nat. Poiss., vol. 20, p. 441, 1847 (type locality: New Guinea, Amboina, Vanikoro, Bourbon). Guichenot, Notes Ile Réunion, vol. 2, p. 29, 1863.—Day, Fishes of Malabar, p. 235, 1865.

Clupea melanura Günther, Cat. Fish. Brit. Mus., vol. 7, p. 449, 1868 (compiled).—Day, Fishes of India, pt. 4, p. 641, 1878 (India); Fauna British India, Fishes, vol. 1, p. 378, 1889.—Weber, *Siboga* Exped., Fische, vol. 57, p. 7, 1913 (Salibabu).

Clupea (*Harengula*) *melanurus* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 111, 1866–72 (Sumatra, Nias, Bali, Celebes, Ternate, Amboina, Saparua, Ceram, New Guinea).

Clupea (*Harengula*) *melanura* Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 72, 1913 (Salibabu).

Clupea (*Paralosa*) *melanurus* Bleeker, Atlas Ichth. Ind Néerland., vol. 6, pl. (11) 269, fig. 5, 1866–72.

Clupea (*Alausa*) *melanura* Martens, Preuss. Exped. Ost.-Asien, vol. 1, p. 405 1876 (Bangkok).

Harengula melanura Sauvage, Hist. Nat. Madagascar, Poiss., p. 492, pl. 48, fig. 4, 1891 (Réunion, Zanzibar, Vanikoro, Indian Archipelago).

? *Clupea latulus* (not Valenciennes) Thiollière, Fauna Woodlark, p. 207, 1857 (Woodlark Island).

Harengula (*Paralosa*) *valenciennesi* Bleeker, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 300, 1868 (Waigiu). (No description.)

Clupea rechingeri Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 115, pt. 1, p, 1424, 1906 (type locality: Upolu).

Harengula vanicoris Jordan and Seale, Bull. Bur. Fisher., vol. 25 (1905), p. 187, 1906 (on *Alausa melanura* Valenciennes).

Harengula sondaica (not Bleeker) Kendall and Goldsborough, Mem. Mus. Comp. Zool., vol. 26, p. 243, 1911 (Nukuhiva, Marquesas Islands).

Sardinella jussieu (not Lacépède) Fowler, Mem. Bishop Mus., vol. 10, p. 30, 1928 (Nukuhiva material).

Depth 4 to 4¼; head 3⅖ to 3¾, width 2½ to 3⅛. Snout 3½ to 3¾ in head from snout tip; eye 3¼ to 3⅗, greater than snout or interorbital, adipose lids narrow; maxillary ¼ to ½ in eye, expansion 1⅖ to 1¾ in eye, length 2¼ to 2⅖ in head; no teeth; interorbital 5 to 5½, slightly elevated, largely level; cheek and preopercle venulose, opercle entire. Gill rakers 28 ? + 45, finely lanceolate; gill filaments ¾ gill rakers, which ¾ of eye.

Scales (pockets) 39 or 40 in median lateral series to caudal base and 5 more on latter; 13 scales transversely, 13 predorsal. Abdominal serrae 17+12. Scales all fallen.

D. III, 12 or 13, first branched ray 1½ to 1⅗ in total head; A. II, 15, I or II, 16, I, first branched ray 4 to 4¾; caudal forked (damaged); least depth of caudal peduncle 2⅘ to 3; pectoral 1⅘ to 1⅞; ventral 2⅒ to 2⅕.

Back drab brown. Sides and lower surface gray to silvery white. Dorsal and caudal pale gray brown. Iris whitish, also lower fins.

Zanzibar, Réunion, India, Siam, East Indies, Philippines, Melanesia, Micronesia, Polynesia. My account of this species in "The Fishes of Oceania" differs somewhat as the depth is given at 3⅓ to 3⅔ and the lower gill rakers 50.

U.S.N.M. No. 65861. Nukuhiva, Marquesas Islands. *Albatross* collection 1899. Length, 40 to 74 mm. 25 examples. As *Harengula sondaica*.

HARENGULA ZUNASI Bleeker

Harengula zunasi Bleeker, Verh. Batav. Genootsch. (Japan), vol. 26, pp. 5, 117, 1857 (type locality: Nagasaki); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 3, p. 6, 1858 (Japan).—Ishikawa and Matsuura, Prelim. Cat. Fish. Mus. Tokyo, p. 8, 1897.—Jordan and Starks, Proc. U. S. Nat. Mus., vol. 28, p. 193, 1905 (Gensan, Corea).—Jordan and Starks, Proc. U. S. Mus., vol. 31, p. 515, 1906 (Port Arthur).—Jordan and Herre, Proc. U. S. Nat. Mus., vol. 31,

p. 634, 1906 (Tokyo, Onomichi, Tomokamai, Wakanoura, Nagasaki, Tsuruga).—FRANZ, Abh. Bayer. Akad. Wiss., vol. 4, Suppl. vol. 1, p. 5, 1910 (Sagami and Aburatsubo).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 302, 1917 (Amoy, China, Japan).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 590, 1930 (Nagasaki).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 40, 1930 (Far East seas).—SCHMIDT, Bull. Acad. Sci. U. S. S. R., 1930, p. 108 (Nagasaki).—SCHMIDT and LINDBERG, Bull. Acad. Sci. U. S. S. R., 1930, p. 1187 (Tsuruga).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 19, 1931 (Nagasaki).—TANAKA, Jap. Fish. Life Colours, No. 48, 1933.—TARANETZ, Bull. Pac. Sci. Inst. Fisher. Oceanogr., vol. 11, p. 36, 1937 (Far East seas).—FOWLER, List Fish. Malaya, p. 27, 1938 (reference).

Clupea zunasi GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 451, 1868 (type).—ELERA, Cat. Fauna Filip., vol. 1, p. 583, 1895 (Luzon, Cavite, Santa Cruz).—KISHINOUYE, Journ. Imp. Fisher. Bur. Tokyo, vol. 14, p. 98, pl. 20, fig. 4, 1907.

Clupea (*Alausa*) *zunasi* MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 405, 1876 (Yokohama, Manila, Singapore, Batjan).

Sardinella zunasi JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 349, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 53, 1901 (reference).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Nagasaki).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 183, 1920 (Shinagawa).

Sardinella zunashi MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan and Genzan, Korea).

Clupea kowal (not Rüppell) SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 235, pl. 107, fig. 1, 1846 (Donurat and Nagasaki Bays).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 451, 1868 (Amoy).

Clupea isingleena RICHARDSON, Ichth. China Japan, p. 304, 1846 (type locality: Chinese Seas).—ELERA, Cat. Fauna Filip., vol. 1, p. 582, 1895 (Luzon, Manila Bay).

Depth 3⅕ to 3⅓; head 2¾ to 4, width 2 to 3⅕. Snout 4⅛ to 4½ in head from snout tip; eye 3¼ to 3¾, greater than snout or interorbital, adipose lid covering last third of eye, though not evident in young; maxillary reaches ¼ to ½ in eye, expansion 1½ to 1⅗ in eye, length 2¼ to 2⅖ in head from snout tip; no teeth; interorbital 4⅞ to 4¾ in head from snout tip, slightly elevated, level medianly; cheek, preopercle and opercle with radiating venules, also top of head, predorsal and humeral region with venules. Gill rakers 25+48, fine lanceolate, equal gill filaments, which 1⅔ in head.

Scales 39 or 40 in median lateral series to caudal base and 4 or 5 more on latter; 11 transversely, 13 or 14 predorsal. Ventral axillary scaly flap ¾ fin. Scales with 4 transverse wide set vertical striae; circuli as fine, parallel, vertical striae basally, none apical, where membranous edge of scale extended and coarsely fringed with parallel horizontal striae.

D. III, 13, I, first branched ray 1⅗ to 1⅔ in total head length; A. III, 16, I, first branched ray 3⅗ to 3⅔; caudal 3⅔ to 3⅘ in rest of body; least depth of caudal peduncle 2¼ to 2⅖ in total head length; pectoral 1⅖ to 1⅗; ventral 2⅕ to 2¼.

Back neutral or gray-brown, with steel blue reflections. Head above brownish. Sides and entire under surfaces bright silvery white. Dorsal and caudal pale brownish, terminally little deeper brownish, though not blackish. Lower fins whitish.

Philippines, China, Japan, Korea.

U.S.N.M. No. 22515. Tokio, Japan. Japanese Government. Length, 104–128 mm. 4 examples.

U.S.N.M. No. 38807. Japan. Educational Mus. Tokyo. Length, 113–120 mm. 2 examples.

U.S.N.M. No. 45255. Yuensan, Korea. P. L. Jouy. Length, 33–56 mm. 69 examples.

U.S.N.M. No. 49496. Tokio, Japan. *Albatross* collection. Oct. 1896. Length, 122 mm.

U.S.N.M. No. 62343. Wakanoura, Japan. Jordan and Snyder. Length, 103–109 mm. 3 examples.

U.S.N.M. No. 71109. Nagasaki, Japan. *Albatross* collection. August 4, 1906. Length, 125–129 mm. 2 examples.

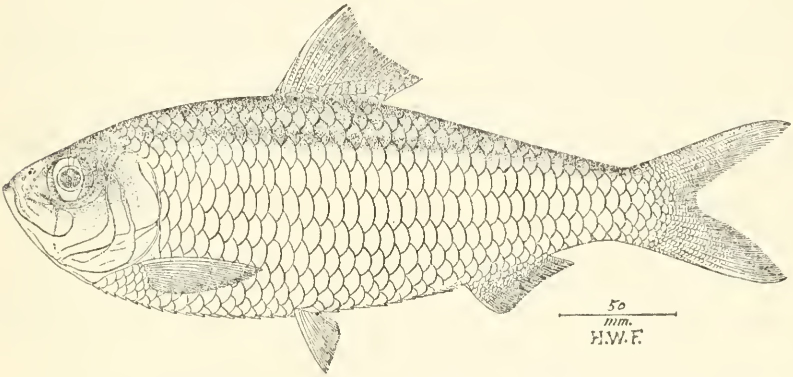

FIGURE 15.—*Harengula nymphaca* (Richardson): Specimen from Hongkong.

HARENGULA NYMPHAEA (Richardson)

FIGURE 15

Clupea nymphaca RICHARDSON, Ichth. China Japan, p. 304, 1846 (type locality: China).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 428, 1868 (type).—ELERA, Cat. Fauna Filip., vol. 1, p. 583, 1895 (Luzon, Manila).

Harengula nymphaca RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 63 (Swatow).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 392, 1917 (type).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 598, 1930 (Hong Kong).

Harengula fijiensis FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 63, p. 63, 1923 (type locality: Fiji).—FOWLER, Mem. Bishop Mus., vol. 10, p. 31, 1928 (copied).

Depth 3 to 3½; head 3¾ to 4, width 2¼ to 2⅖. Snout 3⅖ to 3⅞ in head from snout tip; eye 3⅕ to 3⅓, subequal with or longer than snout or interorbital; maxillary ¼ to ⅓ in eye, expansion 1⅖ to 1⅗ in eye, length 2 to 2⅛ in head from snout tip; closed mandible slightly protrudes; interorbital 4 to 5⅕, nearly level; venules on cheek few and weak, few also at occipital and humeral regions. Gill rakers 30 to 36+62 to 64, finely lanceolate, equal gill filaments or 1⅔ in eye.

Scales 36 or 37 in median lateral series to caudal base, partly caducous; 11 transversely, 14 predorsal. Abdominal serrae 18+12 or 13. Axillary ventral scale ⅔ length of fin. Scales with 6 transverse striae of which several may be incomplete medially; apical surface with numerous pores or pits and edge fimbriate.

D. IV, 13, I or 14, I, first branched ray 1⅗ to 1½ in total head length; A. II, 16, I to 18, I, first branched ray 3⅞ to 4; least depth of caudal peduncle 2¼ to 2⅓; pectoral 1⅓ to 1½; ventral 2⅕ to 2⅔; caudal 3 to 3⅗ in rest of body.

Back slate gray, sides and below silvery white. Fins brown. Dorsal and caudal little darker, lower fins whitish.

China. Reported from Luzon and Manila by Elera. Although externally very similar to *Harengula zunasi* this species differs in its much more numerous gill rakers.

U.S.N.M. No. 57631. "Japan" [locality doubtless China]. P. L. Jouy. Length, 113–135 mm. Lower gill rakers 63. As *Harengula moluccensis* and *Harengula zunasi*. 2 examples.

1 example. U.S.N.M. Fiji. U. S. Exploring Expedition. Length, 64 mm., caudal fin damaged.

U.S.N.M. No. 82799. Fiji. U. S. Exploring Expedition. Length, 73 mm., caudal tips damaged. Type of *Harengula fijiensis*.

A.N.S.P. Nos. 52925 to 52929. Hongkong. Henry W. Fowler. April 1929. Length, 130–146 mm.

HARENGULA DOLLFUSI Chabanaud

Harengula dollfusi CHABANAUD, Bull. Inst. Océanogr. Monaco, No. 627, p. 1, fig. 1 (gill raker, tongue), fig. 2 (scale), 1933 (type locality: Gulf of Suez).

Depth 4 to 5; head 4 to 5. Snout 3½ to 3⅞ in head; eye 3½ to 3⅞, subequal with snout, greater than interorbital; maxillary reaches ⅓ in eye; adipose eyelids well developed; teeth not developed; arborescent venules on cheek, side of head and suprascapula. Lower gill rakers 53 to 56.

Scales 40 to 44 in lateral series; 12 transversely. Abdominal scutes 17 or 18+14.

D. 18 or 19; A. 19 to 21; caudal deeply bifurcate; pectoral rays 15; ventral rays I, 5, inserted opposite fourth or fifth dorsal ray.

Color in formalin upper jaws, end of mandible, dorsal region, and part of eye gray brown. Opercle more or less dark. Poorly defined blackish spot immediately behind angle of opercle. Bases of first three dorsal rays black, extending nearly to end of first ray, rest of fin very finely specked with brown, also caudal. Body otherwise uniform, and other fins hyaline.

Length, 100 to 136 mm. (Chabanaud.)

Gulf of Suez.

Genus SARDINELLA Valenciennes

Sardinella VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 28, 1847. (Type, *Sardinella aurita* Valenciennes, designated by Gill, Proc. Acad. Nat. Sci., Philadelphia, 1861, p. 35.)

Clupeonia VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 345, 1847. (Type, *Clupanodon jussieu* Lacépède, designated by Gill, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 35.)

Amblygaster BLEEKER, Journ. Indian Arch., vol. 3, p. 73, 1849. (Type, *Amblygaster clupeoides* Bleeker, monotypic.)

Sardinia POEY, Mem. Hist. Nat. Cuba, vol. 2, p. 310, 1858–61. (Type, *Sardinia pseudohispanica* Poey, monotypic.)

Body compressed. Belly keeled, without scutes. Adipose eyelids small. No distinct median notch in upper jaw. Teeth feeble, on palatines and tongue. Opercle without radiating striae. Vertical edge of cleithrum covered with dermal fold furnished with 2 obtuse knobs equidistant and with shallow between. Pseudobranchiae present. Branchiostegals 6. Scales larger, usually firm, with interrupted transverse striae. Anal long, last 2 rays enlarged. Ventrals opposite dorsal.

Tropical seas. Species valued mostly as food fishes and for their oil.

ANALYSIS OF SPECIES

a^1. SARDINELLA. Ventral scutes sharp, keeled, exposed.
b^1. Ventral rays 9; dark spot at upper hind edge of opercle.
c^1. Eye 3¼ to 4½ in head; lower gill rakers 110 to 160_____________ allecia
c^2. Eye 5 to 6 in head; lower gill rakers 180 to 250_____________ longiceps
b^2. Ventral rays 8; dark spot at bases of front dorsal rays.
d^1. Depth 2½ to 2⅞.
e^1. Lower gill rakers 130; eye 3⅔ in head_______________________ dayi
e^2. Lower gill rakers 55 to 65; eye 3 to 3⅓_________________ albella
e^3. Lower gill rakers 48 to 55; eye 3⅓ to 3⅔______________ perforata
d^1. Depth 3 to 4; eye 3½ to 4.
f^1. Lower gill rakers 96 to 102________________________ samarensis
f^2. Lower gill rakers 70 to 75__________________________ fimbriata
f^3. Lower gill rakers 58 to 62__________________________ sindensis
f^4. Lower gill rakers 50 to 55___________________________ jussieu
f^5. Lower gill rakers 38 to 44__________________________ melanura
a^2. AMBLYGASTER. Ventral scutes little evident, scarcely protrude from groove containing them.
g^1. Depth 4⅔ to 5⅓; lower gill rakers 36 to 40; eye 3⅓ to 4⅓ in head; maxillary reaches nearly or quite to eye; ventral below front half of dorsal________________________________ sirm
g^2. Depth 4⅓ to 4⅔.
h^1. Maxillary not reaching eye; scutes 16+13 or 14__ clupeoides
h^2. Maxillary reaches below pupil; scutes 20+15______ posterus

Subgenus SARDINELLA Valenciennes

SARDINELLA ALLECIA (Rafinesque)

Clupea alleeia RAFINESQUE, Caratteri nuovi animali piante Sicilia, p. 57, 1810 (type locality: Sicily).

Engraulis desmaresti RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 455, 1826 (type locality: Nice).

Clupea desmaresti RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 479, pl. 9, fig. 22, 1826.

Clupea auro-vittata SWAINSON, Nat. Hist. Animals, vol. 2, p. (293) 385, 1839 (type locality: Sicily, Palermo).

? *Clupea caeruleo-vittata* RICHARDSON, Ichth. China Japan, p. 305, 1846 (type locality: Chinese Seas; Canton).

Sardinella aurita VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 263, pl. 594, 1847 (type locality: Gulf of Moree).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 378, 1917 (Cape Cod to Rio Janeiro; Black Sea to Mediterranean; Indo Australian Archipelago, China, South Japan).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 163, fig. 64, 1936 (Brazil; Adriatic; Mediterranean).

Sardinella anchovia VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 269, 1847 (type locality: Rio Janeiro; Martinique).

Sardinella lemura BLEEKER, Nat. Tijdschr. Nederland, Indië, vol. 4, p. 500, 1853 (type locality: Batavia).

Clupea (Sardinella) lemuru BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (9) 267, fig. 1, 1866–72.

Clupea (Harengula) lemuru BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 108, 1866–72 (Java).

Clupea lemuru GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 430 1868 (type).

Sardinia pseudohispanica POEY, Mem. hist. nat. Cuba, vol. 2, p. 311, 1858–61 (type locality: Cuba).

Clupea longiceps (not Valenciennes) DAY, Fishes of India, pt. 4, p. 637, 1878 (part); Fauna British India, Fishes, vol. 1, p. 373, 1889.

Clupea (Harengula) longiceps WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 82, 1913 (part).

Clupea brasiliensis STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 80, pt. 1, p. 182, 1879 (type locality: Rio Janeiro).

Sardinella euxina ANTIPA, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 78. p. 46, pl. 3, figs. 12–18, 1906 (type locality: Coast of Constanza).

Depth 3⅔; head 3⅖, width 2½. Snout 3⅔ in head from snout tip; eye 4⅛, 1⅕ in snout, greater than interorbital, adipose lid posteriorly covers ⅓ of eye; maxillary reaches ¼ in eye, expansion 1⅔ in eye, length 2½ in head from snout tip; front of upper jaw without distinct notch medially; teeth obsolete or absent; interorbital 5, very slightly elevated, level medially; few weak venules on cheek, head otherwise smooth. Gill rakers 93+168, finely setiform, nearly equal eye; gill filaments ⅔ gill rakers.

Scales 43 in median lateral series to caudal base and 5 more on latter; 13 transversely, 17 predorsal. Abdominal serrae 12+15. Scales with 4 or 5 transverse vertical striae, incomplete medially on scale; circuli all as fine parallel basal striae, none apically, with uneven cutaneous edge.

D. IV, 14, first branched ray 2 in total head length; A. III, 15, I, first branched ray $5\frac{3}{4}$; caudal $1\frac{1}{3}$, well forked and lobes sharply pointed; least depth of caudal peduncle $3\frac{1}{10}$; pectoral $1\frac{4}{5}$; ventral $2\frac{2}{3}$.

Back brown, also upper surface of head. Sides and under surface silvery white. Iris silvery white. Dorsal and caudal pale brownish, other fins whitish.

East Indies, China, and southern Japan. Also in the Mediterranean and Black Seas and Atlantic. *Clupea allecia* Rafinesque seems to be the oldest name applicable to the present species.

U.S.N.M. No. 57632. Japan. P. L. Jouy. Length, 145 mm.

SARDINELLA LONGICEPS Valenciennes

Sardinella longiceps Valenciennes, Hist. Nat. Poiss., vol. 20, p. 273, 1847 (type locality: Pondicherry).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 379, 1917 (Mombasa, Muscat, India).—Hornell and Nayudu, Madras Fisher. Bull., vol. 17, p. 129, 1924 (life history).—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 30, No. 1, p. 36, 1924 (Calicut); Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 257, 1927 (Orion).—Herre, Fishes Herre Philippine Exped. 1931, p. 14, 1934 (Estancia; Culion; Manila).—Roxas, Philippine Journ. Sci. vol. 55, p. 278, pl. 2, fig. 1 (scale), 1934 (Luzon; Polillo; Mindoro; Leyte; Panay; Mindanao).—Roxas and Martin, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 21, 1937 (reference).

Clupea longiceps Günther, Cat. Fish. Brit. Mus., vol. 7, p. 428, 1868 compiled).—Day, Fishes of India, pt. 4, p. 637, pl. 161, fig. 2, 1878 (Sind, West India, East Indies, Ceylon, Andamans); Fauna British India, Fishes, vol. 1, p. 373, 1889.—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^e Note, p. 117, 1929 (Phurochai).

Clupea (*Harengula*) *longiceps* Chevey, Inst. Océanogr. Indo-Chine, 19^e note, p. 9, 1932 (Cochinchina).

Harengula longiceps Seale, Philippine Journ. Sci., vol. A 3, p. 14, 1908 (Manila Bay).

Sardinella neohowii Valenciennes, Hist. Nat. Poiss., vol. 20, p. 274, 1847 (type locality: Cananor; Malabar).—Day, Fishes of Malabar, p. 220, 1865 (copied).

Clupea neohowii Günther, Cat. Fish. Brit. Mus., vol. 7, p. 448, 1868 (Cochin).

Alausa scombrina Valenciennes, Hist. Nat. Poiss., vol. 20, p. 442, 1847 (type locality: Cananor, Malabar; Mahé, Seychelles).

Harengula moluccensis (not Bleeker) Evermann and Seale, Bull. Bur. Fisher., vol. 26, p. 53, 1906–1907 (Bacon).

Depth $4\frac{1}{8}$ to $4\frac{1}{2}$; head $2\frac{7}{8}$ to $3\frac{2}{5}$, width 2 to $2\frac{1}{3}$. Snout $3\frac{1}{2}$ to $3\frac{7}{8}$ in head from snout tip; eye 4 to $5\frac{1}{3}$, $1\frac{1}{5}$ to $1\frac{2}{5}$ in snout, subequal with or slightly greater than interorbital, adipose lids broad; maxillary reaches $\frac{1}{3}$ in eye, expansion $1\frac{1}{3}$ to $1\frac{2}{5}$ in eye, length $2\frac{2}{3}$ to $2\frac{3}{4}$ in head from snout tip; upper jaw with slight median notch; no teeth; interorbital $5\frac{1}{5}$ to $5\frac{1}{2}$, broadly convex; arborescent striae from preorbital to preopercle above, venules also spreading out horizontally on opercle above and branch extends forward to supraorbital, cluster spreads over cheek, another radiating also at lower angle of preopercle and humeral venules well developed over at least 3 scales. Gill rakers 158+200, finely setiform, little longer than gill filaments, equal eye. Notch above and below bony knob along inner edge of gill opening.

Scales 46 or 47 in median lateral series to caudal base and 5 more on latter; 12 or 13 transversely, 14 to 16 predorsal. Scales firmly adherent, narrowly imbricated. Scales with 2 to 4 incomplete or more or less broken vertical parallel striae and dozen or more irregular horizontal apical marginal lines, mostly connected or obsolete; circuli vertically parallel, fine.

D. iv, 13 or 14, first branched ray 2⅗ to 2¾ in total head length; A. ii, 13, first branched ray 5⅛ to 5⅓; caudal 1⅗ to 1⅔, well forked, slender lobes pointed; least depth of caudal peduncle 3⅖ to 4½; pectoral 1⅗ to 1⅔; ventral 3 to 4.

Back slaty, sides and lower surface pale to whitish. Fins all pale.

Arabia, Mombasa, Seychelles, India, Ceylon, Andamans, East Indies, Philippines.

1 example. Iloilo, Panay Island. April 2, 1929. Length, 118 mm. Lieut. H. C. Kellers.

1 example. Iloilo. April 6, 1929. Length, 113 mm. Lieut. H. C. Kellers.

22945. Maricaban Island. January 20, 1908. Length, 145 mm.

5380, 5381. Oton market, Iloilo. March 30, 1908. Length, 144–146 mm.

13 examples. Philippines. Length, 147–165 mm.

1 example. Shore above Iloilo River. June 2, 1908. Length, 60 mm. Lt. H. C. Kellers.

6 examples. Zamboanga, Mindanao. May 29, 1908. Length, 100–120 mm.

U.S.N.M. No. 56066. Bacon, Philippines. Bureau of Fisheries (3607). Length, 153 mm. As *Harengula moluccensis*.

U.S.N.M. No. 56141. Bureau of Fisheries (3603). Length, 153 mm. Lower gill rakers 140.

2 examples. A.N.S.P. Calicut, India. James Hornell. Length, 157–166 mm.

SARDINELLA DAYI Regan

FIGURE 16

Sardinella dayi Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 381, 1917 (type locality: Karwar, India).—Fowler, Journ. Bombay Bat. Hist. Soc., vol. 30, No. 1, p. 36, 1924 (Calicut).

Depth 2⅔ to 3; head 3 to 4⅕, width 2¼ to 2⅔. Snout 3¾ to 4 in head from snout tip; eye 3¾ to 4, equals snout, greater than interorbital, adipose lids broad; maxillary reaches ⅓ to ½ in eye, expansion 1½ to 1¾ in eye, length 2⅛ to 2⅓ in head from snout tip; no teeth; interorbital 4¼, broadly convex, median ridge pronounced; branch of arborescent striae or venules from preorbital to preopercle above, spreading backward above over opercle horizontally; large cluster on cheek; small wider-set venules radiate down flange of preopercle and few along humeral edge of gill opening horizontally.

Gill rakers 68+90, finely lanceolate, about long as eye; gill filaments 3/5 length of gill rakers. Inside edge of gill opening with single notch.

Scales 38 to 42 in median lateral series to caudal base and 4 or 5 more on latter; 12 or 13 transversely, 12 to 17 predorsal. Abdominal scutes 16 or 17+12 to 14. Scales firmly adherent, narrowly imbricated. Scales with 2 vertical wide spaced parallel striae; 20 to 25 marginal striae apically; circuli fine, vertically parallel.

D. III, 13 or 14, first branched ray 1⅗ to 1⅞ in total head length; A. III, 17, first branched ray 3⅞ to 4; caudal 1 to 1⅕, strongly forked, slender lobes pointed; least depth of caudal peduncle 2¼ to 1⅞; ventral 2½ to 2⅔.

Back slaty brown. On level from upper eye edge till nearly opposite depressed dorsal end, 5 or 6 short obsolete vertical darker streaks. Sides and lower surface pale to whitish. Dorsal and caudal tinted grayish, tip of former dusky, other fins whitish.

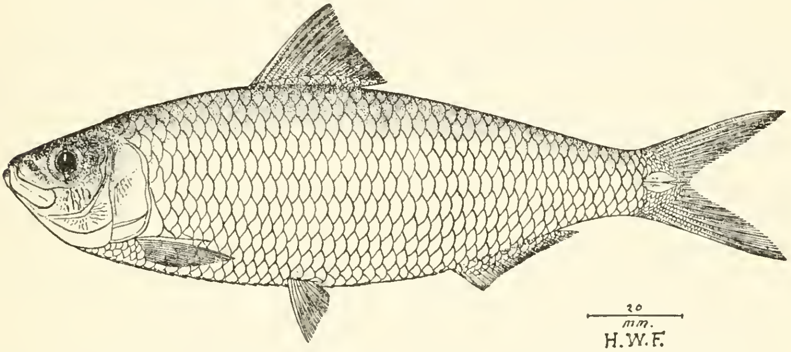

FIGURE 16.—*Sardinella dayi* Regan: U.S.N.M. No. 19954, from Mauritius.

India, Mauritius.

U.S.N.M. No. 19954. Mauritius. Captain Page. Length 123 to 156 mm. Gill rakers 56+96, finely setiform.

3 examples. A.N.S.P. Calicut, India. James Hornell. Length 105 to 106 mm.

SARDINELLA ALBELLA (Valenciennes)

Kowala albella VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 362, 1847 (type locality: Pondicherry).

Clupea albella GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 424, 1868 (copied).

Sardinella brachysoma BLEEKER, Verh. Batav. Genootsch. (Haring), vol. 24, p. 19, 1852 (type locality: Batavia, Java).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, p. 489, 1905 (Baram, Borneo).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 381, 1917 (Madras, Java, Amboina; types of *Sardinella brachysoma* and *Harengula hypselosoma*).—FOWLER, Hong Kong Nat., vol. 2, p. 117, 1931 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 20, 1937 (reference).

Clupea (*Sardinella*) *brachysoma* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (9) 279, fig. 4, 1866–72.

Clupea (*Harengula*) *brachysoma* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 104, 1866–72 (Java, Sumatra, Banka).—WEBER and BEAUFORT, Verh. Akad. Wet. Amsterdam, vol. 17, p. 13, 1912 (Batavia); Fishes Indo-Australian Archipelago, vol. 2, p. 70, fig. 25, 1913 (Batavia).

Clupea brachysoma GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 423, 1868 (type; Java).—DAY, Fishes of India, pt. 4, p. 635, pl. 163, fig. 3, 1878 (Indo China); Fauna British India, Fishes, vol. 1, p. 371, 1889.—HARDENBERG, Treubia, vol. 14, livr. 3, p. 305, 1934 (Rokan River mouth, Sumatra).

Harengula brachysoma FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 71, p. 1, 1927 (Benkoelen, Sumatra).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia vol. 87, p. 90, 1935 (Bangkok; Sriracha; Paknam); vol. 89, p. 131, 1937 (Bangkok; Paknam; Tachin).

Harengula hypelosoma BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 8, p. 427, 1855 (type locality: Amboina).

Clupea hypselosoma GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 431, 1868 (type).

Clupea hypelosoma MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 375, 1880 (Port Jackson) (error).

Clupea (*Harengula*) *hypselosoma* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 104, pl. (9) 267, fig. 2, 1866–72 (Amboina).

Alosa kowal (not Rüppell) GÜNTHER, Fishes of Zanzibar, p. 123, 1866 (part).

Depth 2¾; head 3⅗, width 2¼. Snout 4⅛ in head from snout tip; eye 4¼, 1$\frac{1}{10}$ in snout, subequal with interorbital, adipose lids broad, length 2⅕ in head from snout tip; maxillary reaches ½ in eye, expansion 1½ length; no teeth, edges of jaws tranchant and with distinct median upper notch; interorbital 4⅔, low, little convex; supraorbital, cheek opercle above and upper posterior side of head well as humeral region venulose. Gill rakers about 30+65, fine, slender, longest equal gill filaments or nearly long as eye.

Scales 40 in median lateral series to caudal base and 4 more on latter; 14 transversely, 18 predorsal. Abominal scutes 17+12. Axillary ventral scale 1½ in fin length. Scales with 4 to 6 transverse slightly waved complete striae; circuli also all parallel and vertical very fine, not extending apically where margin of scale fimbriate.

D. IV, 13, I, first branched ray 1⅔ in total head length; A. III, 17, last 2 rays larger than preceding, first branched ray 3¾; caudal 3½ in rest of body, slender lobes pointed; least depth of caudal peduncle 2½ in head; pectoral 1¼; ventral 2⅕.

Back neutral gray to olivaceous, sides and lower surface silvery white. Iris whitish, with yellowish tints. Sides of head also with yellowish tinge. Fins all pale or whitish.

Zanzibar, Siam, East Indies, Philippines, China.

5471 to 5482. Basud River, Luzon. June 15, 1909. Length, 56–94 mm.

22 examples. Basud River, Luzon. June 15, 1909. Length, 56–95 mm.

4 examples. Panabutan Bay, Mindanao. February 5, 1908. Length, 33–43 mm.

1 example. Port Jamelo, Luzon. July 13, 1908. Length, 48 mm.

1 example. Santa Cruz, Marinduque. April 24, 1908. Length, 37 mm., caudal tips damaged.

1 example. A.N.S.P. Baram, Borneo. Dr. W. H. Furness 3rd. Wistar Institute of Anatomy. Length, 188 mm.

SARDINELLA PERFORATA (Cantor)

Clupeonia perforata CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, pt. 2, p. 1276, 1849 (type locality: Pinang Sea, Malay Peninsula, Singapore, Sumatra).

Clupea (*Spratella*) *perforata* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (10) 268, fig. 2, 1866–72.

Clupea (*Harengula*) *perforata* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 110, 1866–72 (Java, Sumatra, Pinang, Singapore, Bintang, Banka, Amboina); Nederland. Tijdschr. Dierk., vol. 4, p. 147, 1874 (compiled; Amoy).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 158, 1907 (Gischin).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 74, 1913 (Batavia, Puger, Balikpapan).

Clupea perforata BLEEKER, Verslag. Kon. Akad. Wet. Amsterdam, vol. 16, p. (356) 176, 1864 (Siam).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 424, 1868 (type; type of *Spratella kowala;* Amboina).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 8, 1913 (Lumbok; Macassar).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat., Genova, ser. 3, vol. 10, p. 618, 1926 (Sarawak).—HARDENBERG, Treubia, vol. 15, livr. 3, p. 231, 1936 (Padang Tikarbay; Telok Pekadai, Borneo).

Sardinella perforata EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26, (1906) p. 54, 1907 (Bacon).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 382, 1917 (Persian Gulf, Malay Archipelago; types; types of *Spratella kowala*, not *Clupalosa bulan*).—FOWLER, Mem. Bishop Mus., vol. 10, p. 30, 1928 (compiled); vol. 11, p. 315, 1931 (reference); Hong Kong Nat., vol. 2, p. 117, 1931 (Philippines).—HERRE, Fishes Herre Philippine Exped. 1931, p. 14, 1934 (Manila).—ROXAS, Philippine Journ. Sci., vol. 55, p. 277, pl. 2, fig. 10 (scale), 1934 (Luzon; Panay).—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 44, p. 5, fig. 1, 1934 (Bender Abbas, Persian Gulf).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 20, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 10, 1937 (Gulf of Siam).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 12, 1937 (Singapore; Malacca).—FOWLER, List Fish. Malaya, p. 31, 1938 (reference).

Harengula perforata BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 591, pl. 75, fig. 1 (scale), 1912 (Batavia).

Spratella kowala (not *Clupea kowala* Rüppell) BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 2, p. 492, 1851 (Rio; Batavia); Nederland. Tijdschr. Dierk., vol. 2, p. 35 (Siam), p. 57 (Amoy), p. 176, 1865 (Siam; copied).

Clupea kowal (part) GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 450, 1868.

Harengula (*Spratella*) *kowala* BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 294 (type locality: Rio Bintang), p. 300, 1868 (Waigiu).

Clupea (*Clupalosa*) *kowal* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (8) 266, fig. 5, 1866–72.

Clupea zunasi (not Bleeker) SCHMELTZ, Cat. Mus. Godeffroy, No. 4, p. 25, 1869 (Savay); No. 7, p. 58, 1879 (Savaii).

Clupea zeunasi PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Savaii).

Harengula sundaica (not Bleeker) JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 770, 1905 (Negros).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27, (1907) p. 236 (1908) (Iloilo).

Depth 2⅘ to 2⅞; head 3¾ to 3⅘, width 2. Snout 4 in head from snout tip; eye 3¾ to 3⅘, greater than snout or interorbital, broad adipose lid covers at least last third of eye; maxillary reaches ¼ to ⅓ in eye, expansion 1¾ to 2 in eye, length 2⅗ to 2½ in head from snout tip; front of upper jaw forms rather broad angle above; no teeth;

interorbital 5, slightly elevated, level medially; cheeks, opercle, occipital and humeral regions venulose. Gill rakers 30+58 to 60, finely setiform, 1⅘ in eye; gill filaments ¾ gill rakers.

Scales 37 to 41 in median lateral series to caudal base and 5 or 6 more on latter; 12 scales transversely, 14 predorsal. Abdominal serrae 17 or 18+14. Axillary ventral scale ⅘ of fin. Scales with 4 to 6 transverse wide set or vertical striae; circuli fine, few apically where pitted.

D. III, 15, I or III, 14, I, first branched ray 1⅓ to 1⅗ in total head length; A. III, 16, I, first ray 3¾ to 4½; caudal 3⅕ to 3⅓ in rest of body; least depth of caudal peduncle 2⅓ to 2⅗ in total head length; pectoral 1¼ to 1⅓; ventral 2.

Back brown, also head above. Sides and below silvery white. Iris silvery white, turning gray in formalin specimens. Dorsals and caudal pale brownish. Lower fins whitish.

Arabia, Persian Gulf, Pinang, Malay Peninsula, Singapore, East Indies, Philippines, Siam, Amoy, Polynesia.

20142. Bacoor, Luzon. June 15, 1908. Length, 78 mm.

8862. Catbalogan, Samar. April 15, 1908. Length, 50–125 mm. Lower gill rakers 50 to 55. The small ones with dark spot at front of dorsal basally and ends of caudal lobes dusky, as shown in Bleeker's figure of *Clupea* (*Spratella*) *gibbosa*. 3 examples.

9100. Catbalogan Anchorage. April 15, 1908. Length, 119 mm.

7767 to 7771. Catbalogan. April 17, 1908. Length, 177–138 mm.

9 examples. Cavite market. June 14, 1908. Length, 74–117 mm.

5976, 5978, 5981, 5985. Cavite market. December 1, 1908. Length, 85–127 mm.

19405, 19406. Iloilo market. March 28, 1908. Length, 107–113 mm.

13185, 14157 to 14159. Iloilo market. June 1, 1908. Length, 96–137 mm.

7750. Jolo market. February 12, 1908. Length, 115 mm.

5153, 5154, 5156. Manila market. December 12 to 18, 1907. Length, 122–129 mm.

8170 to 8179, 8181 to 8185, 9064. Manila market. June 12, 1908. Length, 83–123 mm.

4 examples. Manila market. June 13, 1908. Length, 130–138 mm.

9 examples. Manila market. June 17, 1908. Length, 108–121 mm.

9065, 13673. Manila market. June 24, 1908. Length, 120 and 121 mm.

5 examples. Manila market. April 20, 1909, Length, 115–128 mm.

21996. Near mouth of Tayabas River, Luzon. February 25, 1909. Length. 107 mm.

2 examples. No data. "Faoselts herring." Length, 103–130 mm.

1 example. Port Langcan, Palawan. April 8, 1909. Length, 138 mm.

8 examples. Tacloban market. July 25, 1909. Length, 83–134 mm.

3 examples. Sandakan Bay, Borneo. March 2, 1908. Length, 88–96 mm.

29 examples. Sandakan Bay. March 21, 1908. Length 87–115 mm. Most all show brilliant purplish, greenish, and violet reflections, some coppery on lower surfaces and many have the tints like those of tinsel. As usual tails of all uniformly pale.

9958, 11467, 11469. Kowloon market, China. September 8, 1908. Length, 95–111 mm.

10666. Kowloon market. October 5, 1908. Length, 125 mm.

U.S.N.M. No. 51969. Negros. Dr. Bashford Dean. Length, 53–83 mm., caudal ends broken. Lower gill rakers 58. As *Harengula sundaica.*

U.S.N.M. No. 72198. Iloilo, Philippines. R. C. McGregor. Length, 82 mm. Lower gill rakers 59. As *Harengula sundaica.*

U.S.N.M. No. 72505. Batavia, Java. Bryant and Palmer. Lower gill rakers 60. Length, 125–143 mm. 3 examples.

U.S.N.M. No. 72506. Batavia. Bryant and Palmer. Length, 143 mm.

U.S.N.M. No. 72507. Batavia. Bryant and Palmer. Length, 110–112 mm. 3 examples.

U.S.N.M. No. 72508. Batavia. Bryant and Palmer. Length, 125–135 mm. 3 examples.

SARDINELLA SAMARENSIS Roxas

Sardinella samarensis ROXAS, Philippine Journ. Sci., vol. 55, p. 275, pl. 2, fig. 11 (scale), 1934 (type locality: Barrio Cinco, Catbalogan, Samar Province, Samar Island).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 21, 1937 (reference).

Depth 3½ to 3⁷⁄₁₀; head 3⅘ to 4, width 2⅖. Snout slightly greater than eye, tip produced to form with vertex a prominent concavity; eye 4 in head, 1⅘ nearer snout tip than hind opercle edge; maxillary reaches ½ in eye, length 2⅖ in head; interorbital slightly less than orbit, equals greatest opercle width, rather concave; postocular part of head deeply veined, and venules on cheek. Gill rakers 96 to 102, finely lanceolate, flattened, smooth, short, ½ of gill filaments which ⁷⁄₁₀ to ⅘ of eye.

Scales 43 to 45 in median lateral series; 9 to 11 in transverse series; 16 to 18 predorsal. Abdominal scutes 16 to 18+14 or 15. Scales adherent, subcircular, nonfenestrate, with 2 to 5 transverse striae, one usually complete; hind edge irregularly pectinate.

D. 18, 1⅖ times nearer snout tip than caudal base, depressed base equals height or 2 in head; A. 15, low, 1⅕ times longer than dorsal, 1⁷⁄₁₀ in head, 1⅗ times length of caudal peduncle; pectoral equals anal base; ventral 1½ times orbit, equidistant from pectorals and anal, inserted below middle of dorsal.

Color?

Length, 104–114 mm. (Roxas.)

Philippines. Said to resemble *Harengula ovalis* and *Sardinella fimbriata* in the form of its body, though its other characters quite distinct.

SARDINELLA FIMBRIATA (Valenciennes)

Spratella fimbriata VALENCIENNES, Hist Nat. Poiss., vol. 20, p. 359, pl. 600, 1847 (type locality: Malabar).—DAY, Fishes of Malabar, p. 233, 1865.—KNER, Reise *Novara,* Fische, p. 329, 1865 (Madras).

Clupea fimbriata GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 427, 1868 (type of *Kowala lauta;* Madras).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 404, 1876 (Manila).—DAY, Fishes of India, pt. 4, p. 637, pl. 161, fig. 3, 1878 (India, Malabar, Vizagapatam).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 42, 1885 (Manila Bay).—DAY, Fauna British India, Fishes, vol. 1, p. 373, 1889.—Elera, Cat. Fauna Filip., vol. 1, p. 582, 1895 (Luzon, Manila).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).—Hardenberg, Treubia, vol. 14, livr. 3, p. 305, 1934 (Rokan R. mouth, Sumatra).

Clupea (Sardinella) fimbriata Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, pl. (13) 271, fig. 5, 1866-72 (not text).

Clupea (Harengula) fimbriata Bleeker, Verh. Akad. Wet. Amsterdam, vol. 18, p. 3, 1879 (China).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 75, fig. 26, 1913 (Batavia, Kragan, Rembang, Banjuwangi, Onrust, Nias, Balikapan, Kotabaru, Macassar).—Chabanaud, Service Océanagr, Pêches Indo-Chine, 1^e note, p. 8, 1926 (Tonkin).

Sardinella fimbriata Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 382, 1917 (Akyab, Orissa, Malabar, Madras, types of *Kowala lauta*).—Fowler, Copeia, No. 58, p. 62, 1918 (Philippines); Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 257, 1927 (Bacon); Hong Kong Nat., vol. 2, No. 2, p. 118, 1931 (reference).—Herre, Fishes Herre Philippine Exped., 1931, p. 14, 1934 (Bauang Sur; Manila; Nasigbu; Alabat).—Roxas, Philippine Journ. Sci., vol. 55, p. 276, pl. 2, fig. 5 (scale), 1934 (Luzon; Mindoro; Panay).—Suvatti, Index Fish. Siam, p. 9, 1937 (Cantaburi).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 21, 1937 (reference).

Harengula fimbriata Oshima, Annot. Zool. Japon., vol. 11, p. 2, 1926 (Haiko, Hainan).—Herre and Myers, Raffles Mus. Bull. 13, p. 12, 1937 (Singapore).

Sardinella perforata (not Cantor) Evermann and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 54, 1907 (Bacon specimens; part).

Harengula sundaica (not Bleeker) Jordan and Richardson, Bull. Bur. Fisher., vol. 27 (1907), p. 236, 1908 (Manila, Aparri; not Iloilo).

Depth 3 to 3⅓; head 3¾ to 4⅛, width 2 to 2$\frac{1}{10}$. Snout 3½ to 3¾ in head from snout tip; eye 3¼ to 3¾, 1⅛ in snout, greater than interorbital, adipose lid covers posterior ⅗ of eye; maxillary reaches ⅕ to ¼ in eye, length 2⅓ to 2½ in head from snout tip; few obscure, minute, simple teeth in mandible; interorbital 3⅘ to 5⅘, flat; cheek, preopercle and postocular regions venulose. Gill rakers 43+80, lanceolate, length ⅔ of eye.

Scales (pockets) 36 to 38 in median lateral series to caudal base and 4 more on latter; 12 transversely, 12 to 15 predorsal. Abdominal scutes 17+12 or 13. Scales with 3 vertical striae, usually incomplete medially, apically scale deeply pitted.

D. iv, 14, i or 15, i, first branched ray 1⅓ to 1⅖ in total head length; A. iii, 15, i to 17, i, first ray 3⅗ to 3¾; least depth of caudal peduncle 2⅕ to 2⅖; pectoral 1⅓ to 1⅖; ventral 2 to 2¼; caudal 3 to 3⅖ in rest of body.

Pale brown, back dark, demarcation line not distinct. Muzzle and caudal tips dusky.

India, East Indies, Philippines, Hainan, China.

U.S.N.M. No. 56232. Bacon, Philippines. Bureau of Fisheries (3658). Lower gill rakers 79. As *Sardinella perforata*.

U.S.N.M. No. 56233. Bacon. Bureau of Fisheries (3659). Length, 120 mm. Lower gill rakers 75. As *Sardinella perforata*.

U.S.N.M. No. 72197. Manila. R. C. McGregor. Length, 120 mm. Lower gill rakers 76. As *Harengula sundaica*.

U.S.N.M. No. 72255. Aparri, Luzon. R. C. McGregor. Length, 135 mm., caudal ends broken. Lower gill rakers 80. As *Harengula sundaica*.

SARDINELLA SINDENSIS (Day)

Clupea sindensis DAY, Fishes of India, pt. 4, p. 638, pl. 163, fig. 2, 1878 (type locality: Kurachee, India); Fauna British India, Fishes, vol. 1, p. 374, 1889.—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 354, 1929 (Travancore).

Sardinella sindensis REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 383, 1917 (Sind, Bombay, Amboina, Formosa).—HERRE and MYERS, Raffles Mus. Bull. 13, p. 12, 1937 (Singapore).

? Meletta venenosa VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 377, 1847 (type locality: Seychelles).

Alosa venenosa GÜNTHER, Fishes of Zanzibar, p. 122, 1866 (Zanzibar).

Clupea venenosa GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 449, 1868 (Zanzibar).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 42, 1885 (Rubi, New Guinea).

Depth 3¼ to 4; head 3⅔ to 4⅓. Snout long as or shorter than eye, which 3½ to 3¾ in head; maxillary reaches ⅓ in eye. Lower gill rakers 58 to 66.

Scales 44 in medial lateral series; 11 to 13 transversely. Ventral scutes 17 to 19+12 to 15.

D. 17 to 19; A. 18 to 21; ventral 8, below or before middle of dorsal.

Dark spot at base of front dorsal rays. Upper part of dorsal and ends of caudal lobes sometimes blackish. Length, 130 mm. (Regan.)

Zanzibar, Seychelles ?, India, East Indies, Formosa. According to Day reaches 203 mm.

SARDINELLA JUSSIEU (Lacépède)

Clupanodon jussieu LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 469, 474, pl. 11, fig. 2, 1803 (type locality: Mauritius).

Clupeonia jussieui VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 346, 1847 (Mauritius, Bourbon, Madagascar).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 345, 1863 (Madagascar).—GUICHENOT, Mem. Soc. Sci. Nat. Cherbourg, ser. 2, vol. 2, p. 147, 1866 (Madagascar).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 495, 1891 (Madagascar).

Clupeonia jussioei VALENCIENNES, Hist. Nat. Poiss., vol. 20, pl. 599, 1847.

Clupeonia jussieu GUICHENOT, Notes ile Réunion, vol. 2, p. 29, 1863.

Clupea jussieui GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 430, 1868 (copied).

Sardinella jussieui FOWLER, Proc. Acad. Nat. Sci. Philadephia, vol. 79, p. 257, 1927 (Vigan, Orani, Orion, Philippines).

Sardinella jussieu FOWLER, Mem. Bishop Mus., vol. 10, p. 30, 1928 (compiled; not Nukuhiva); Proc. Acad. Nat. Sci., Philadelphia, 1929, p. 592 (Shanghai), p. 598, 1930 (Hong Kong); Mem. Bishop Mus., vol. 11, p. 315, 1931 (reference); Hong Kong Nat., vol. 2, p. 118, 1931 (reference); Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 411, 1934 (Natal; Philippines).—ROXAS, Philippine Journ. Sci., vol. 55, p. 273, pl. 2, fig. 2 (scale), 1934 (Luzon).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 365, fig. 5, 1935; vol. 89, p. 130, 1937 (Bangkok).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 21, 1937 (reference).—Fowler, List Fish. Malaya, p. 31, 1938 (reference).

Clupeonia fasciata Valenciennes, Hist. Nat. Poiss., vol. 20, p. 349, 1847 (type locality: Bourbon).—Guichenot, Notes Île Réunion, vol. 2, p. 29, 1863.

Sardinella fasciata McCulloch, Australian Mus. Mem., vol. 5, p. 38, 1929 (reference).

Clupea gibbosa Bleeker, Journ. Indian Arch., vol. 3, p. (69) 72, 1849 (type locality: Macassar).—Günther, Journ. Mus. Godeffroy, pt. 16, p. 381, 1909 (Ponapé, Samoa, Tonga, Society Islands, Fiji).

Clupea (Spratella) gibbosa Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, pl. (8) 266, fig. 6, 1866–72.

Clupea (Harengula) gibbosa Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 106, 1866–72 (Java, Sumatra, Nias, Singapore, Banka, Bali, Celebes).

Harengula gibbosa Jordan and Seale, Bull. Bur. Fisher., vol. 26 (1906) p. 4, 1907 (Philippines).—Jordan and Richardson, Bull. Bur. Fisher., vol. 27 (1907), p. 236, 1908 (Manila).—Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 590, 1912 (Batavia).

Sardinella gibbosa Regan, Ann. Durban Mus., vol. 1, p. 458, 1917 (Durban); Ann Mag. Nat. Hist., ser. 8, vol. 19, p. 383, 1917 (Durban, Mombasa, Ganjam, Madras, Siam, Celebes, Java, Amboina, type of *Spratella tembang*).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete).—Herre and Myers, Raffles Mus. Bull., No. 13, p 12, 1937 (Singapore)

Spratella tembang Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 774, 1852 (type locality: Macassar; Batavia).—Kner, Reise *Novara*, Fische, p. 329, 1865 (Java).—Günther, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 36, 1880 (Levuka and Kandavu, Fiji).

Clupea tembang Günther, Cat. Fish. Brit. Mus., vol. 7, p. 426, 1865 (type; Java).—Alleyne and Macleay, Proc. Linn. Soc. New South Wales, vol. 1, p. 350, 1877 [Bramble Cay, Torres Straits (3 vomited by noddy)].—Macleay, Proc. Linn. Soc. New South Wales, vol. 2, p. 264, 1878 (Port Darwin); vol. 4, p. 377, 1879 (Torres Straits).—Schmeltz, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Tonga).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 259, 1881 (reference).—Pöhl, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Tonga).

Spratella fimbriata (not Valenciennes) Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 27, 1852 (Batavia, Java, in sea).—Schmeltz, Cat. Mus. Godeffroy, No. 2, p. 9, 1865 (Samoa); No. 4, p. 25, 1869 (Upolu); No. 5, p. 36, 1874 (Tonga).

Clupea fimbriata Schmeltz, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Upolu).—Steindachner, Denkschr. Akad. Wiss., Wien, math.-nat. Kl., vol. 71, pt. 1, p. 158, 1907 (Gischin).

Clupea exile Kishinouye, Journ. Coll. Agric. Tokyo, vol. 2, p. 384, pl. 30, fig. 1, 1911 (type locality: Chichijma, Bonin Islands).

Sardinella sindensis (not Day) Regan, Ann. Durban Mus., vol. 1, p. 167, 1916 (Durban).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, p. 297, 1917 (reference).

Depth 3⅖ to 4; head 3¾ to 4, width 2⅕ to 2¼. Snout 3¾ to 3⅞ in head from snout tip; eye 3 to 3⅘, 1¼ in snout, greater than interorbital; maxillary reaches ⅓ to ⅖ in eye, expansion 1⅗ to 2 in eye, length 2⅕ to 2⅖ in head from snout tip; only few anterior teeth in jaws; interorbital 4¼ to 4¾, little elevated, nearly level; cheek, opercle, preopercle, upper side of head and humeral region venulose. Gill rakers 28+65, lanceolate, 1⅖ in eye.

Scales 40 to 42 in median lateral series to caudal base and 4 or 5 more on latter; 11 or 12 scales transversely, 13 predorsal. Abdominal scutes 17 or 18+12 or 13. Scales with 4 or 5 vertical striae, only one apically complete, no pores.

D. IV, 13, I or 14, I, first branched ray 1⅖ to 1⅔ in total head length; A. II, 15, I, first branched ray 4¾ to 5; least depth of caudal peduncle 2⅔ to 2⅘; pectoral 1⅓ to 1⅖; ventral 2⅛ to 2¼; caudal 3¼ to 3¾ in rest of body, forked.

Brown on upper back, underlaid olive-brown line defining silvery white below. Muzzle tipped brown. Dorsal and caudal pale brown, dark spot at base of former anteriorly, other fins whitish.

Arabia, Mombasa, Natal, Mauritius, Bourbon, Madagascar, Singapore, East Indies, Philippines, China, Bonin Islands, Northern Territory of Australia, Queensland, Micronesia, Polynesia.

12998. Alibijaban Island, Ragay Gulf, Luzon. March 3, 1909. Length, 39 mm.

3 examples. Atulayan Bay, Luzon. 130-foot seine. June 17, 1909. Length, 48–106 mm.

9 examples. Baganga Bay, Mindanao. May 15, 1908. Length, 61–107 mm.

1 example. Balamban, Cebu. April 2, 1908. Length, 45 mm.

2 examples. Bacoor, Luzon. June 15, 1908. Length, 62–65 mm.

1 example. Cataingan Bay, Masbate. April 1, 1908. Length, 51 mm.

1 example. Cavite market. June 26, 1908. Length, 80 mm.

5 examples. Cavite and San Roque markets. June 27, 1908. Length, 73–84 mm.

5 examples. Cebu market. September 4, 1909. Length, 54–112 mm. [1889; 1896.]

1 example. Gomomo Island. December 3, 1909. Length, 41 mm.

6036 to 6039. Hinunangan Beach, Leyte. July 30, 1909. Length, 123–145 mm. 6 examples.

9 examples. Lucena anchorage. Electric light. February 24, 1909. Length, 38–44 mm.

1 example. Manila Bay, Luzon. December 7, 1907. Length, 50 mm.

2 examples. Manila Bay. December 9, 1907. Length, 66–73 mm.

19720. Mantaquin Bay, Palawan. April 1, 1909. Length, 33–106 mm. 3 examples.

1 example. Mati, Pujada Bay, Mindanao. May 15, 1909. Length, 46 mm.

5 examples. Matnog Bay, Luzon. June 1, 1909. Length, 128–135 mm.

1 example. Nasugbu, Luzon. January 16, 1908. Length, 27 mm.

2 examples. Nasugbu, Luzon. January 21, 1908. Length, 26–30 mm.

1 example. Nato, Luzon. June 19, 1909. Length, 62 mm.

7 examples. Nogas Point, Panay. February 4, 1908. Length, 100–124 mm.

19568, 13956. Paluan Bay, Mindoro. December 11, 1908. Length, 65–120 mm. 10 examples.

4 examples. Panabutan Bay, Mindanao. February 5, 1908. Length, 37–48 mm.

1 example. Port Binanga. January 8, 1908. Length, 30 mm.

6 examples. Port Dupon, Leyte. March 17, 1909. Length, 26–31 mm.
13466, 13467. Port San Pio Quinto, Camiguin Island. November 10, 1908. Length, 57–96 mm.
1 example. Santa Maria, Siquijor Island. Seine. August 11, 1909. Length, 64 mm.
3 examples. San Vicente Harbor, Luzon shore. November 13, 1908. Length, 32–38 mm.
1 example. Varadero Harbor. July 22, 1908. Length, 51 mm.
23 examples. Varadero Bay, Mindoro. July 28, 1908. Length, 20–53 mm.
9 examples. Varadero Bay. July 23, 1908. Length, 41–69 mm.
13314, 13315, 13318, 13320. Amboina market. December 7, 1909. Length, 123–150 mm. 9 examples.
1 example. Gane Road, Gillolo Island. Electric light. December 1, 1909. Length, 59 mm.
6 examples. Gomomo Island. Dynamite. December 3, 1909. Length, 36–46 mm.
2 examples. Tifu Bay, Bouro Island. December 20, 1909. Length, 96–104 mm.
21316, 21317. Uki, Bouru Island. December 9, 1909. Length, 98–140 mm.
D. 5581. September 26, 1909. Length, 89 mm.
U.S.N.M. No. 56299. Cavite, Luzon. Dr. G. A. Lung. Length, 54–114 mm. 2 examples.
U.S.N.M. No. 72501. Batavia, Java. Bryant and Palmer. 1909. Length, 142 mm.
U.S.N.M. No. 72502. Batavia. Bryant and Palmer. Length, 135 mm.
U.S.N.M. No. 72503. Batavia. Bryant and Palmer. Length, 128–133 mm. 6 examples.
U.S.N.M. No. 72504. Batavia. Bryant and Palmer. Length, 137 mm.
A.N.S.P. No. 53068. Natal coast. 1927. H. W. Bell Marley. Length, 178 mm.

SARDINELLA MELANURA (Cuvier)

Clupea melanura Cuvier, Règne animal, ed. 2, vol. 2, p. 318, 1829 (on Lacépède).—Seale and Bean, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).

Clupea (*Harengula*) *melanura* Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 72, 1913 (part).

Harengula melanurus Bleeker, Nat. Tijds. Nederland. Indië, vol. 5, p. 254, 1853 (Ceram).

Harengula melanura Herre, Field Mus. Publ. 353, zool. ser., vol. 21, p. 30, 1936 (Fiji; New Hebrides).

Sardinella melanura Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 384, 1917 (Indian Ocean and Archipelago).—Fowler, Bishop Mus. Bull. 22, p. 37, 1925 (Tahiti); Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 194 (Delagoa Bay; Tahiti material); 1927, p. 257 (Vigan; Santa Maria); Mem. Bishop Mus., vol. 10, p. 30, 1928 (Tahiti, Papeete, Suva, Society Islands, Nukahiva); vol. 11, No. 5, p. 315, 1931 (reference).—Herre, Fishes Herre Philippine Exped., 1931, p. 14, 1934 (Cape Bolinao, Pangasinan).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, 1934 (Sanoer, Bali).—Roxas, Philippine Journ. Sci., vol. 55, p. 274, pl. 2, fig. 13 (scale), 1934 (Batan; Leyte).—Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 20, 1937 (reference).—Suvatti, Index Fish. Siam, p. 10, 1937 (Maenam Tapi below Bandon).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 130, 1937 (Bangkok).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 12, 1937 (Singapore).

Clupanodon sinensis (part) Lacépède, Hist. Nat. Poiss., vol. 5, pp. 468, 471, pl. 11, fig. 3, 1803 (Asia).

Clupeonia commersoni Valenciennes, Hist. Nat. Poiss., vol. 20, p. 350, 1847 (type locality: Mauritius; Bombay).

Clupeonia commersonii Guichenot, Notes Île Réunion, vol. 2, p. 29, 1863.—Schmeltz, Cat. Mus. Godeffroy, No. 2, p. 9, 1865 (Samoa).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 494, 1891.

Clupea commersonii Schmeltz, Cat. Mus. Godeffroy, No. 4, p. 25, 1869 (Upolu).

Harengula commersoni Jordan and Seale, Bull. Bur. Fisher., vol. 25 (1905), p. 186, 1906 (Apia).—Kendall and Goldsborough, Mem. Mus. Comp. Zool., vol. 26, p. 244, 1911 (Vavau, Papeete, Suva).

Clupea otaitensis (Solander) Valenciennes, Hist. Nat. Poiss., vol. 20, p. 351, 1847 (name only).

Clupea atricauda Günther, Cat. Fishes British Mus., vol. 7, p. 426, 1868 (type locality: Ceram; Amboina; Port Blair).—Schmeltz, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Upolu).—Pöhl, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Upolu).—Schmeltz, Cat. Mus. Godeffroy, No. 5, p. 37, 1874 (Upolu).—Day, Fishes of India, pt. 4, p. 636, pl. 161, fig. 5, 1878 (Andamans).—Meyer, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 42, 1885 (Tabukan, Sangi; Ternate).—Günther, Journ. Mus. Godeffroy, pt. 16, p. 387, 1909 (Samoa, Society Islands, Hervey Islands, Vanicolo ? Tahiti).—Weber, *Siboga* Exped., Fische, vol. 57, p. 8, 1913 (Manado; West Ceram).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).

Clupea (Harengula) atricauda Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 106, pl. (10) 268, fig. 5, 1866–72 (Nias, Bali, Celebes, Ternate, Batjan, Obi Major, Ceram, Amboina, Saparua).—Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 115, pt. 1, p. 1424, 1906 (Upolu).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 80, 1913 (Batavia, Puger, Menado, Sawa, Kairatu).

Sardinella atricauda Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1900, p. 519 (Tahiti); 1911, p. 206 (same materials).—Suvatti, Index Fish. Siam, p. 9, 1937 (Menam).

Clupea (Harengula) sundaica Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 105, 1866–72 (not figure) [type locality: Java; Celebes (on Bleeker 1853)].

Clupea ogura Kishinouye, Journ. Coll. Agric. Tokyo, vol. 2, p. 384, pl. 30, fig. 2, 1911 (type locality: Futani Harbor, Chichijma, Bonin Islands).

Sardinella oguro Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 183, 1920 (Ogasawarajima).

Sardinella jussieu (not Lacépède) Fowler, Mem. Bishop Mus., vol. 10, p. 30, 1928 (part).

Depth $3\frac{3}{5}$ to $3\frac{7}{8}$; head $3\frac{2}{5}$ to $3\frac{3}{5}$, width $2\frac{1}{4}$ to $2\frac{1}{2}$. Snout $3\frac{1}{4}$ to $3\frac{2}{5}$ in head from snout tip; eye $3\frac{1}{4}$ to $3\frac{2}{3}$, subequal with snout, greater than interorbital, broad lid covers last $\frac{2}{5}$ of eye; maxillary reaches $\frac{1}{3}$ in eye, expansion $1\frac{1}{2}$ to $1\frac{2}{3}$ of eye, length $2\frac{1}{10}$ to $2\frac{1}{4}$ in head from snout tip; interorbital 4 to $4\frac{1}{2}$, flat; most of head, except jaws, finely venulose. Gill rakers 16 to 18+35 to 44, finely lanceolate, $\frac{3}{4}$ of eye; gill filaments $\frac{2}{3}$ gill rakers, equal pseudobranchiae.

Scales 39 to 43 in median lateral series to caudal base and 4 more on latter; 10 to 12 scales transversely, 11 to 16 predorsal; scales narrowly imbricated. Abdominal serrae 17 or 18+11 to 13.

Scales with 1 to 6 transverse vertical striae of which only one complete; circuli fine, vertically parallel. Humeral venules large.

D. iv, 13, i or iii, 14, first branched ray 1½ to 1⅔ in total head length; A. iii, 16, i, to iii, 18, i or ii, 15, first branched ray 4 to 4⅔; caudal subequal with head to 3 in rest of body, forked; least depth of caudal peduncle 2½ to 3⅕ in head; pectoral 1⅖ to 1½; ventral 2⅒ to 2⅕.

Back neutral slate to bluish, with violet reflections, otherwise largely silvery white. Snout tip above and mandible tip deeper brown than slaty tint of head above. Iris and sides of head white. Fins pale or whitish. Dorsal and caudal slightly darker and caudal tips broadly blackish.

Delagoa Bay, Mauritius, India, Andamans, East Indies, Philippines, Hainan, China, Bonin Islands, Micronesia, Polynesia.

2 examples. Baganga Bay, Mindanao. Seine. May 15, 1908. Length, 91–92 mm.
2 examples. Mantaquin Bay, Palawan. April 1, 1909. Length, 54–58 mm.
1 example (with 19954 U.S.N.M.) Mauritius. Capt. Page. Length, 125 mm., caudal ends broken.
U.S.N.M. No. 41560. Samoa. C. H. White. Length, 111 mm. As *Sardinella vanicoris*.
U.S.N.M. No. 52519. Apia, Samoa. Bureau of Fisheries (07563). Length, 120 mm., caudal tips broken.
U.S.N.M. No. 58045. Zamboanga. Dr. E. A. Mearns. Length, 123–130 mm. 5 examples.
U.S.N.M. No. 65859. Papete, Tahiti. Bureau of Fisheries (05793). Length, 99 mm.
U.S.N.M. No. 65860. Fiji. Bureau of Fisheries (08887, 08888, 08817 to 08819, 08825). Length, 110–135 mm. All poor specimens.
1 example. A.N.S.P. Tahiti.
A.N.S.P. No. 63157. Delagoa Bay, Portuguese East Africa. July 1923. H. W. Bell Marley. Length, 152 mm.

Subgenus AMBLYGASTER Bleeker

SARDINELLA SIRM (Walbaum)

Clupea sirm Walbaum, Artedi Pisc., vol. 3, p. 38, 1792 [on Forskål, Descript. Animal., p. 17, 1775 (type locality: Arabia)].—Rüppell, Neue Wirbelth., Fische, p. 77, fig. 1, 1835 (Red Sea, Massaua).—Günther, Cat. Fish. Brit. Mus., vol. 7, p. 425, 1868 (Zanzibar, Batavia, types of *Sardinella leiogastroides*).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 598, 1871 (Mozambique).—Günther, Journ. Mus. Godeffroy, pt. 16, p. 383, 1909 (Kingsmills).

Clupea (*Amblygaster*) *sirm* Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 62, 1913 (Tandjong Priok).

Sardinella sirm Jordan and Seale, Proc. U. S. Nat. Mus., vol. 28, p. 770, 1905 (Negros); Bull. Bur. Fisher., vol. 25 (1905), p. 186, 1906 (Apia).—Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 284, 1917 (Zanzibar, Batavia, Celebes, Misol, types of *Sardinella leiogastroides* and *Clupea pinguis*).—Fowler, Mem. Bishop Mus., vol. 10, p. 31, 1928 (copied); Hong Kong Nat., vol. 2, p. 119, 1931 (reference).—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No.

4, p. 16, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 14, 1934 (Dumaguete).—ROXAS, Philippine Journ. Sci., vol. 55, No. 3, p. 272, pl. 2, fig. 4 (scale), 1934 (Luzon; Polillo; Mindoro; Bantayan; Negros; Camiguin; Mindanao; Samal; Bungau; Sulade).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, 1934 (Sanoer, Bali); vol. 87, p. 90, fig. 10, 1935 (Bangkok).—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, p. 13, fig. 1 (scale), 1935–36 (Massaua).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 20, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 12, 1937 (Trengganu).—FOWLER, List Fish. Malaya, p. 32, 1938 (reference).

Clupea punctata RÜPPELL, Neue Wirbelth. Fische, p. 78, pl. 21, fig. 2, 1835 (type locality: Red Sea).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 412, 1868 (Zanzibar).

Harengula punctata VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 297, 1847 (Red Sea; Massauah).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 493, 1891.

Clupea bipunctata (Ehrenberg) VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 297, 1847 (name in synonymy).

Sardinella leiogaster VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 270, 1847 (type locality: Indian Ocean; Ceylon).—KNER, Reise *Novara*, Fische, p. 327, 1865 (Hong Kong).—HERRE, Fishes Herre Philippine Exped. 1931, p. 14, 1934 (Jolo).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, 1934 (Benoa, Bali).—HERRE, Mid-Pacific Mag., vol. 10, No. 2, p. 163, 1935 (Pelew Islands).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 20, 1937 (reference).

Clupea liogaster KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 598, 1871 (Red Sea).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 158, 1907 (Makalla).

Clupea (*Sardinella*) *leiogaster* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (4) 262, fig. 6, 1872.

Clupea leiogaster DAY, Fishes of India, pt. 4, p. 636, 1878 (Ceylon).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^{e} note, p. 117, 1929 (Phuroc-hai).

Clupea (*Amblygaster*) *leiogaster* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 102, 1866–72 (Java, Sumatra, Singapore, Celebes, Batjan, Obi Major, Ceram).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 61, 1913 (Batavia, Onrust Island).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1^{e} note, p. 8, 1926 (Annam coast; Poulo-Condore).

Amblygaster leiogaster BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 590, 1912 (Batavia).

Elops javanicus (Kuhl and Van Hasselt) VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 270, 1847 (Java, name only).

Sardinella leiogastroides BLEEKER, Nat Tijdschr. Nederland. Indië, vol. 7, p. 255, 1854 (type locality: Manado, Celebes).

Clupea (*Sardinella*) *leiogastroides* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (14) 272, fig. 2, 1866–72.

Clupea (*Alosa*) *leiogastroides* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 102, 1866–72 (Celebes, Ternate, Amboina).

Clupea pinguis GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 10, p. 425, 1872 (type locality: Misol); *in* Brenchley, Cruise of *Curaçoa*, p. 426, 1873 (type).

Clupea (*Harengula*) *pinguis* WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 83, 1913 (type).

Depth 4⅔ to 5⅕; head 4 to 4⅕, width 1⅞ to 2. Snout 2⅞ to 3 in head from snout tip; eye 3¾ to 4⅛, 1¼ to 1½ in snout, 1 to 1⅕ in interorbital, covered by broad adipose lid; maxillary reaches 4/5 or quite to eye, expansion 1½ to 1¾ in eye, length 2⅔ to 2¾ in head from snout tip; front of upper jaw with slight median notch; no teeth; interorbital 4⅕ to 5, little elevated, level medianly; cheek, preopercle, and opercle with radiating venules. Gill rakers 21+43, slender, 1¼ in gill filaments or 1½ in eye.

Scales 39 or 40 in median lateral series to caudal base and 3 more on latter; 11 or 12 transversely, 15 predorsal. Scales on body narrowly imbricated. Abdominal serrae 17 or 18+14 to 16. Axillary ventral scale ⅞ fin. Scales with 2 incomplete marginal vertical striae; circuli all basal, fine, vertical, none apical.

D. IV, 12 or 13, first branched ray 1⅘ to 1⅞ in total head length; A. III, 15, first branched ray 5¾ to 7, last ray 5; caudal 1⅕, deeply forked; least depth of caudal peduncle 3⅓ to 3⅗; pectoral 1½ to 1⅗; ventral 2⅔ to 2⅘.

Head above and back above brown to dusky, sides and under surfaces bright silvery white. Iris silvery white. Dorsal and caudal pale brownish, other fins whitish.

Red Sea, Arabia, Zanzibar, Mozambique, Ceylon, East Indies, Philippines, China, Micronesia, Polynesia. Bleeker's figure is rather poor in detail as it fails to show the cheek venules, the last anal ray enlarged, the alar caudal scales faulty and the axillary ventral scale too short.

5 examples. Alimango Bay, Burias Island. March 6, 1909. Length, 194–222 mm.

12718. Atulayan Bay, Luzon. June 18, 1909. Length, 136 mm.

26 examples. Butauanan Island. June 12, 1909. Length, 37–63 mm. Brilliant shining silvery white on sides and below.

1 example. Busin Harbor, Burias Island. April 23, 1908. Length, 47 mm.

12360. Candaraman Island, Balabac. January 14, 1909. Length, 200 mm.

11067 to 11080. Cebu market. March 27, 1908. Length, 143–200 mm. 6 examples

7574. Cebu market. April 6, 1908. Length, 198 mm.

3 examples. Cebu market. August 28, 1909. Length, 134–167 mm.

11798, 11799. Guijulugan, Negros. April 2, 1908. Length, 205–208 mm.

1 example. Hinunangan Beach, Leyte. July 30, 1909. Length 75 mm.

16188, 16189. Jolo market. March 6 or 7, 1908. Length, 197–294 mm.

8 examples. Pasacao, Ragay Gulf. March 8, 1909. Length, 29–30 mm. Fry.

1 example. Port Uson, west of Pinas Island. December 17, 1908. Length, 93 mm.

13313, 13316, 13319, 13321. Amboina market. December 7, 1909. Length, 137–187 mm. 7 examples.

12 examples. Tanakeke Island. December 21, 1909. Length, 180–195 mm.

U.S.N.M. No. 52359. Apia, Samoa. Bureau of Fisheries (04626). Length, 183–236 mm. 4 examples. This exceeds the dimensions given as 150 mm. by Weber and Beaufort.

SARDINELLA CLUPEOIDES (Bleeker)

Amblygaster clupeoides BLEEKER, Journ. Indian Archip., vol. 3, p. 73, 1849 (type locality: Macassar). (Error.)

Clupea clupeoides GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 425, 1868 (Java).

Clupea (Sardinella) clupeoides BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (14) 272, fig. 1, 1866–72.

Clupea (Amblygaster) clupeoides BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 103, 1866–72 (Java, Sumatra, Bintang, Celebes).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 63, fig. 23, 1913 (Batavia).

Sardinella clupeoides JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 770, 1905 (Negros).—EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26 (1906), p. 54 (1907) (Bulan).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19 p. 385, 1917 (type).—FOWLER, Hong Kong Nat., vol. 2, p. 119, 1931 (reference).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped., 1931, p. 14, 1934 (Culion).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 20, 1937 (reference).—FOWLER, List Fish. Malaya, p. 31, 1938 (reference).

Kowala lauta CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1279, 1849 (type locality: Pinang).

Clupea (Harengula) fimbriata (not Valenciennes) BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 105 (not figure), 1866–72 (copied Cantor).

Clupea fimbriata DAY, Fishes of India, pt. 4, p. 637, 1878 (part; copied).

Clupea okinawensis KISHINOUYE, Journ. Imp. Fisher. Bur. Tokyo, vol. 14, p. 96, pl. 19, fig. 2, pl. 21, fig. 5, 1907 (type locality: Okinawa, Riu Kiu).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 489, 1912 (Okinawa).

Harengula okinawensis SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 1, p. 20, 1930 (Naha).

Depth 4⅕ to 4⅔; head 3½ to 4⅕, width 1⅞ to 2⅛. Snout 3 to 3⅛ in head from snout tip; eye 3⅗ to 4, 1 to 1¼ in snout, greater to subequal with interorbital or 1¼ in interorbital with age, broad lids largely cover eye; maxillary reaches ¾ to ⅘ to eye, expansion 2 to 2⅖ in eye, length 3 to 3½ in head from snout tip; no teeth; interorbital 4 to 4½, slightly elevated, level medially; cheek, preopercle and opercle with red venules. Gill rakers 17 to 22+ 32 or 33, fine, slender, 1⅓ to 2 in gill filaments, which 1 to 1¼ in eye.

Scales 35 to 42 in median lateral series to caudal base and 3 to 5 more on latter; 11 transversely, 14 to 18 predorsal. Abdominal serrae 16+13 or 14, low. Ventral axillary scale ⅞ length of fin. Scales with 1 to 3 transverse striae, usually incomplete medially; circuli fine, transverse, parallel striae basally, none apically where cutaneous fringed edge with some parallel marginal horizontal grooves.

D. III, 12, I to III, 14, I, first branched ray 2 to 2⅛ in total head length; A. III, 13, I to III, 16, I, first branched ray 4½ to 5; caudal 1⅕ to 1¼, deeply forked, lobes angularly pointed; least depth of caudal peduncle 2⅞ to 3⅔; pectoral 1⅔ to 1⅞; ventral 2 to 2⅘.

Back gray brown, also upper surface of head. Sides and under surface silvery white, also iris. Dorsal and caudal pale brown. Lower fins whitish.

Red Sea, Pinang, East Indies, Philippines, Japan.

U.S.N.M. No. 49289. Red Sea. Bellotti. Length, 126 mm., caudal ends broken. Lower gill rakers 32 ?

U.S.N.M. No. 56045. Bulan, Philippines. Bureau of Fisheries (3243). Length, 192 mm., caudal ends broken. Lower gill rakers 32.

U.S.N.M. No. 71842. Kagoshima, Japan. *Albatross* collection. Length, 290 mm. As *Clupea okinawensis.*

U.S.N.M. No. 71897. Kagoshima, Japan. *Albatross* collection. Length, 280 mm. As *Clupea okinawensis.*

SARDINELLA POSTERUS (Whitley)

Amblygaster posterus Whitley, Records Austral. Mus., vol. 18, p. 144, 1931 (type locality: Fremantle District, Western Australia).

Depth 4⅕; head 3⅗. Eye partly concealed by adipose lids which unite with skin to form gelatinous appearance to most of sides of head; maxillary extending to below pupil; border of upper jaw slightly incised; jaws apparently toothless; teeth on palate and tongue; vertex of head with dense patches of striae behind eyes. Gill rakers fine, elongate, very numerous.

Scales 40 in lateral series; 11 transversely; 17 predorsal. Scapular region scaleless, and like parts of opercles venulous. Body scales striated, with subvertical lines not meeting in middle of each scale. Abdominal scutes 20+15. Belly not strongly compressed but with median ventral scutes keeled.

D. 17, origin nearer snout tip than caudal peduncle; A. 14, II or last 2 rays enlarged, fin base longer than that of dorsal. Bases of anal and caudal fins very scaly. Pectorals subfalciform, nearly equal head without snout; ventrals begin below median dorsal rays.

General color after long preservation, dark grayish above, silvery on sides.

Length, 176 mm. without caudal. (Whitley.)

Western Australia. Although described without reference to relationship it appears to be allied with *Sardinella clupeoides.*

Genus ARENGUS Cornide

Arengus Cornide, Ensayo de una historia de los peces, de las costa de Galicia, p. 91, 1788. (Type, *Arengus minor* Cornide, monotypic.)

Sardina Antipa, Denkschr. Akad. Wiss. Wien, math-nat. Kl., vol. 78, p. (39) 41 (54, 1906. (Type, *Clupea pilchardus* Walbaum, designated by Jordan, Genera of Fishes, pt. 4, p. 512, 1920.)

Sardinops Hubbs, Proc. California Acad Sci., vol. 18, p. 264, 1929. (Type, *Meletta caerulea* Girard, orthotypic.)

Body elongate, moderately compressed, abdomen not sharp edged. Eye with well-developed adipose lids. Mouth moderate, upper jaw without or with slight median notch, lower jaw not prominent. Maxillary not extending beyond middle of eye. Teeth minute or absent, none on vomer. Opercle with grooves radiating toward subopercle. Scales about 54 in medial lateral series, 10 to 14 transversely. Ventral scutes keeled, not projecting beyond edges of their groove. Vertebrae 50 to 53. Dorsal rays 16 to 20, highest anteriorly, median, origin nearer snout tip than caudal base, scaly basal sheath extending to tip of last ray. Anal rays 16 to 20, low, depressible in scaly sheath, last 2 rays enlarged. Caudal forked, on each side enlarged scales at inner edge of scaly part of each lobe. Pectoral scaly at base. Ventral rays 8, inserted below middle or posterior part of dorsal.

Several species widely distributed in the cooler waters of the north and south temperate zones, in tropical waters largely represented by *Sardinella*.

ANALYSIS OF SPECIES

a^1. Head 4; maxillary reaches front edge of eye; lower gill rakers 37____ **dakini**
a^2. Head 3⅓ to 4; maxillary nearly or quite reaches ½ in eye with age; lower gill rakers 70 (young) to 110____________________________________ **sagax**
a^3. Head 3⅔ to 4½; maxillary not reaching ½ in eye; lower gill rakers 60 (young) to 75______________________________________ **neopilchardus**

ARENGUS DAKINI (Whitley)

Sardinops dakini Whitley, Mem. Queensland Mus., vol. 11, p. 114, 1937 (type locality: Thursday Island, North Queensland).

Depth 5; head 3¼. Eye 3¼ to 4 in head, slightly shorter than snout; maxillary reaches front edge of eye, supplemental bone spade shaped; premaxillaries meeting at acute angle; jaws and palate toothless; opercle, preopercle, and interopercle of equal depth; opercle without marked radiating striae, appear obsolescent or reduced to single anterior one; several venules on opercles, preorbital and scapular region; wedge shaped patch of striae each side of vertex. Lower gill rakers 37 long, slender, minutely denticulate, become markedly smaller anteriorly and not appearing overlain by gill rakers of upper portion of arch.

Scales about 40; 10 to 12 transversely; 13 predorsal. Scales deciduous, uniform, not covering smaller auxiliary ones. Large alar scales at pectoral and ventral fins. Other scales on bases of dorsal and anal and 2 large leaf like scales on each side of caudal. Scales with ragged edges but not perforated, vertical radii not continued across each scale but interrupted medially. Adipose eyelids largely conceal eye, unite with skin to give most of sides of head gelatinous appearance. Abdominal scutes 17 or 18+12 to 14.

D. 18, origin before ventral origin and much nearer snout than caudal fin; A. 18+2, rays short except last which enlarged; pectoral rays 19, fin long as head without snout; ventral rays I, 9.

Color in formalin bluish gray above, yellowish below. Eleven more or less distinct dark spots along upper parts of sides. Dusky brown blotch on snout. Few minute fuscous spots at tips of dorsal and caudal lobes, but no prominent dusky blotches on any fins. Fins whiter than body color.

Length, 140–190 mm. (Whitley.)

Queensland.

ARENGUS SAGAX (Jenyns)

Clupea sagax Jenyns, Voy. Beagle, Fish., p. 134, 1842 (type locality; Lima, San Lorenzo Island.)—Günther, Cat. Fish. Brit. Mus., vol. 7, p. 443, 1868 (Japan).—Gilchrist and Thompson, Ann. South African Mus., vol. 6, p. 269, 1908–11 (Natal.)—Gilchrist, Marine Biol. Rep. South Africa, No. 1, p. 57, fig., 1913 (False Bay).

Sardina sagax Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 18, p. 13, pl. 1, fig. 1, 1916 (Chile, California, Japan, South Africa).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, p. 297, 1917 (reference).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 112, 1825 (Table Bay, False Bay, Natal).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 194 (Durban beach).—Barnard, Ann. South African Mus., vol. 21, pt. 2, p. 1017, 1927 (Fowler's record).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 365, fig. 6, 1935 (Durban).

Sardinia sagax Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 412, 1934 (Natal) (error).

Clupea melanosticta Schlegel, *in* Siebold's Fauna Japonica, Poiss., pts. 10–15, p. 237, pl. 107, fig. 3, 1846 (type locality: Japan coasts).—Günther, Cat. fishes Brit. Mus., vol. 7, p. 430, 1868 (China).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 7, 1897.—Kishinouye, Journ. Imp. Fisher. Bur. Tokyo, vol. 14, pp. 71, 94. 97, pl. 17, figs. 1–2, 1907.

Clupanodon melanostictus Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 349, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 53, 1901 (reference).

Sardinella melanosticta Jordan and Herre, Proc. U. S. Nat. Mus., vol. 31, p. 632, 1906 (Hakodate, Tokyo, Yokohama, Tsuruga, Aomori, Misaki, Same, Tateyama, Matsushima Bay, Wakanoura, Kobe, Onomichi, Hakata, Nagasaki).—Franz, Abh. Bayer. Akad. Wiss., vol. 4, Suppl. vol. 1, p. 5, 1910 (Sagami Bay, Aburatsubo, Fukuura).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 38, 1930 (Far East seas).

Sardinia melanosticta Schmidt, Bull. Acad. Sci. U.S.S.R., p. 108, 1930 (Obama); Trans. Pacific Comm. Acad. Sci. U.S.S.R. vol. 11, p. 19, 1931 (Nagasaki; Kagoshima).—Tanaka, Jap. Fish. Life Colours. No. 41, 1933.

Amblygaster melanostictum Snyder, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Otaru, Mororan, Tomakomai, Hakodate, Misaki).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 183, 1920 (Tokyo market).

Amblygaster melanostictus Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 590, 1930 (Tokyo).

Clupea ocellata Pappe, Synops. Edible Fish Cape of Good Hope, p. 29, 1853 (type locality: Cape of Good Hope).—Bleeker, Nat. Tijds. Nederland. Indië, vol. 21, p. 56, 1860 (reference).—Castelnau, Mém. Poiss. Afrique Australe, p. 67, 1861 (Cape of Good Hope).—Pappe, Synops. Edible Fishes Cape of Good Hope, ed. 2, p. 20, 1866 (Cape of Good Hope).—Gilchrist, Marine Invest. South Africa, vol. 6, 1901, p. 153, 1902 (reference).

Sardina ocellata Regan, Ann. Durban Mus., vol. 1, p. 167, 1906 (Natal).
Harengula punctata (not Valenciennes) Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 49, 1853.
Alausa musica Girard, Proc. Acad. Nat. Sci. Philadelphia, 1854, p. 199 (type locality: Caldera Bay, Chile); U. S. Naval Astronom. Exped. Chili, p. 246, pl. 31, figs. 1-4, 1855.
Alausa fimbriata (not *Spratella fimbriata* Valenciennes) Kner and Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 54, 1866, p. 386, fig. 15, 1867 (Valparaiso, Chile).
Clupea advena Phillippi, Arch. Naturg., vol. 45, p. 161, pl. 10, 1879 (type locality: Chile).
Clupea immaculata Kishinouye, Journ. Imp. Fisher. Bur. Tokyo, vol. 14, p. 96, pl. 19, fig. 1, 1907 (type locality: Saga, Kiusiu; Amoy; Swatow, China).
Amblygaster immaculatum Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 166, 1909 (Takao).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).

Depth 4½ to 6; head 3¼ to 3⅓, width 2⅗ to 2⅞. Snout 3⅗ to 3⅔ in head from snout tip; eye 3⅔ to 4¼, 1⅓ to 1½ in snout, greater than interorbital, broad adipose lid largely covering eye; maxillary reaches ¼ to ⅓ in eye, expansion 1⅗ to 1¾ in eye, length 2¼ to 2⅖ in head from snout tip; no teeth; interorbital 2½ to 6⅖, scarcely elevated, largely level; top of head, cheek, and opercle venulose, with 4 radiating striae on front part of opercle from above. Gill rakers 50+100, finely setiform, equal eye; gill filaments ⅗ of gill rakers.

Scales 44 to 50 in median lateral series to caudal base and 5 to 7 more on latter; 13 transversely, 18 or 19 predorsal. Abdominal serrae 20 to 21+15. Scales with 5 to 7 transverse marginal parallel striae above and below, rarely more than 1 complete; circuli very fine, vertical, parallel, none apical where edge fringed.

D. iii, 14, i, first branched ray 1⅞ to 2 in total head length; A. iii, 13, i, first branched ray 4 to 4½; caudal 1¼ to 1⅓, forked, broad lobes triangularly pointed; least depth of caudal peduncle 4 to 4⅛; pectoral 1¾ to 1⅘; ventral 2⅞ to 3.

Back drab brown, also occiput. Sides and lower surface of body silvery white. Dorsal and caudal brownish, little darker terminally, other fins whitish. Iris silvery white. Many examples show row of small dark spots just below dark color of back along and within upper part of whitish area of sides.

Natal, Cape of Good Hope, China, Formosa, Japan, Korea. Also the eastern Pacific shores of America.

U.S.N.M. No. 22533. Shitachi, Japan. Japanese Government. Length, 185–198 mm. 2 examples.
U.S.N.M. No. 44888. Japan. Japanese Government. Length, 173–195 mm., caudal broken. 3 examples.
U.S.N.M. No. 48191. Tanakomai, Japan. S. Nozawa. Length, 193 mm.
U.S.N.M. No. 49468. Tokyo. *Albatross* collection. Length, 143–181 mm. 2 examples.

U.S.N.M. No. 57629. Japan. P. L. Jouy. Length, 158–170 mm. 2 examples.

U.S.N.M. No. 62326. 2 examples One from Misaki. Jordan and Snyder. Length, 156 mm. One from Nagasaki. R. C. McGregor. Length, 135 mm.

U.S.N.M. No. 62327. Japan. Length, 155 mm.

U.S.N.M. No. 71037. Misaki, Sagami, Japan. *Albatross* collection. Length, 92–117 mm. 17 examples.

U.S.N.M. No. 71294. Otaru, Japan. *Albatross* collection. Length, 125–205 mm. 5 examples.

U.S.N.M. No. 71299. Tomakowai, Hokkaido, Japan. *Albatross* collection. 1906. Length, 85–180 mm. 11 examples.

U.S.N.M. No. 71374. Hakodate, Japan. *Albatross* collection. 1906. Length, 96–112 mm. 4 examples.

U.S.N.M. No. 82606. Japan. *Albatross* collection. Length, 93–104 mm. 3 examples.

U.S.N.M. No. 85540. Tsuruga, Japan. Jordan and Snyder. Length, 64–66 mm. 3 examples.

A.N.S.P. No. 53158. Durban beach, Natal. H. W. Bell Marley. January 27, 1925. Length, 136 mm.

ARENGUS NEOPILCHARDUS (Steindachner)

Clupea neopilchardus STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 41, pt. 1, p. 12, 1879 (type locality: Hobson's Bay, Victoria).—KLUNZINGER, Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, p. 416, 1880 (Hobson's Bay).—WAITE, Rec. Canterbury Mus., vol. 1, No. 3, p. 158, 1911 (from *Macruronus* stomachs, New Zealand); vol. 1, No. 4, p. 317, 1912 (reference).

Clupea (Clupanodon) neopilchardus MCCULLOCH, Zool. Res. *Endeavour*, vol. 1, pt. 1, p. 17, 1922 (off Wooded Bluff, Clarence River, New South Wales, 26 to 30 fathoms).

Clupanodon neopilchardus WAITE, Mem. Australian Mus., vol. 4, p. 53, 1899 (off New South Wales); Mem. New South Wales Naturalists Club, No. 2, p. 13, 1904; Rec. Australian Mus., vol. 6, pt. 2, p. 58, 1905 (Houtman's Abrolhos).—STEAD, Fishes of Australia, p. 28, fig. 10, 1906; Edible Fishes New South Wales, p. 25, pl. 4, 1908.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (Melbourne).—ROUGHLEY, Fishes of Australia, p. 30, 1916 (whole coast line; Tasmania).

Sardinella neopilchardus OGILBY, Queensland Naturalist, vol. 1, No. 3, p. 66, 1908 (Moreton I.).

Amblygaster neopilchardus OGILBY, Commerc. Fish Fisher. Queensland, p. 47, 1915 (Brisbane); Mem. Queensland Mus., vol. 5, p. 98, 1916 (South Queensland, Hervey Bay, Moreton Bay, off Cape Moreton).—WAITE, Australian Antarctic Exped., Fishes, vol. 3, p. 56, 1916 (Auckland Islands).

Sardina neopilchardus REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 18, p. 14, pl. 1, fig. 2, 1916 (New South Wales; New Zealand); British Antarctic *Terra Nova* Exped., Zool., vol. 1, No. 4, p. 136, pl. 5, figs. 3–4, 1916 (larvae).

Sardinia neopilchardus MCCULLOCH, Rec. Australian Mus., vol. 12, p. 172, pl. 26, fig. 1, 1919 (Botany Bay).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1923, p. 43 (Victoria specimens).—MCCULLOCH, Fishes New South Wales, ed. 2, p. 17, pl. 5, fig. 54a, 1927.

Sardinia neopilcharda WAITE, Rec. South Australian Mus., vol. 2, p. 37, fig. 53, 1921.

Sardinops neophilchardus McCulloch, Australian Mus. Mem., No. 5, p. 40, 1929 (reference).—Whitley, Mem. Queensland Mus., vol. 11, p. 116, 1937 (Australian references).

Alausa melanosticta (not Schlegel) Valenciennes, Hist. Nat. Poiss., vol. 20, p. 444, 1847 (Bay of Islands, New Zealand).

Clupea sprattus (not Linnaeus) Günther, Proc. Zool. Soc. London, 1871, p. 672, 1871 (Tasmania).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 260, 1882 (copied).—Kent, Naturalist in Australia, p. 175, 1897.

Clupea sagax (not Jenyns) Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 187, 1872 (Melbourne).—Hector, Colonial Mus. Governm. Surv. Dept. Fishes New Zealand, p. 119, pl. 11, fig. 100, 1872; p. 63, 1873 (compiled).—Castelnau, Proc. Linn. Soc. New South Wales, vol. 3, p. 355, 1879 (Port Jackson).—Macleay, Proc. Linn. Soc. New South Wales, vol. 4, p. 371, 1880 (New South Wales); vol. 6, p. 258, 1881 (reference).—Woods, Fish Fisher. New South Wales, p. 86, 1882.—Johnston, Proc. Roy. Soc. Tasmania, 1882, p. 133, 1883.—Arthur, Trans. New Zealand Inst., vol. 15, p. 208, pl. 34, fig. 2, 1883 (Picton).—Ogilby, Cat. Fishes New South Wales, p. 56, 1886 (reference).—Sherrin, Handb. New Zealand, p. 71, 1886.—Lucas, Proc. Roy. Soc. Victoria, new ser. vol. 2, p. 37, 1890 (Victoria).—Hutton, Trans. New Zealand Inst., vol. 22, p. 284, 1890 (reference).—Johnston, Proc. Roy. Soc. Tasmania, 1890, p. 37, 1891 (reference).—Kent, Great Barrier Reef, p. 300, 1893 (Sydney).—Ogilby, Edible Fishes New South Wales, p. 180, pl. 45, 1893.—Kent, Naturalist in Australia, p. 175, 1897.—Hutton, Index Fauna New Zealand, p. 51, 1904.—Waite, Rec. Canterbury Mus., vol. 1, No. 1, p. 10, 1907 (reference).—Zietz, Trans. Roy. Soc. South Australia, vol. 32, p. 294, 1908 (reference).—Ogilby, Marine Dept. Queensland, p. 15, 1911.

Depth 5 to 5⅔; head 3¾ to 4, width 1¾ to 2. Snout 3 to 3¼ in head from snout tip; eye 4 to 4⅖, 1¼ to 1⅖ in eye, subequal with interorbital; maxillary reaches ⅓ to ⅖ in eye, expansion ½ to ⅗ in eye, length 2¼ to 2⅓ in head from snout tip; upper jaw front with slight median notch; no teeth; interorbital 5 to 5½, slightly elevated, flattened; opercle with 4 conspicuous slightly radiating striae from above down posteriorly. Gill rakers 40+75, slender, equal eye; gill filaments 1¾ in eye.

Scales 44 to 50 in median lateral series to caudal base and 4 or 5 more on latter; 11 transversely, 19 to 24 predorsal. Abdominal serrae 17 ? to 20+12 to 17 ? Caudal base scaly. Scales with 6 marginal vertical striae above and as many below, not joined medially; circuli as vertical, parallel, close-set striae, none apical where scale edge fringed.

D. III, 15, I or III, 16, I, first branched ray 1⅘ to 1⅚ in total head length; A. III 16, I, to III, 17, I, first branched ray 4⅔ to 4¾; caudal 1⅛ to 1¼, forked, lobes pointed; least depth of caudal peduncle 4 to 4⅛; pectoral 1⅔ to 1¾; ventral 2¾ to 2⅞.

Deep slate blue above, sides and below silvery white. Mandible tip and snout above leaden dusky. Fins grayish. Anal and paired fins whitish. Iris silvery white.

Queensland, New South Wales, Victoria, Tasmania, South Australia, West Australia, Auckland Islands, New Zealand.

U.S.N.M. No. 47825. Port Jackson. Australian Museum. Length, 162–170 mm., caudal ends broken. 2 examples.

U.S.N.M. No. 48807. Port Jackson. J. D. Ogilby. Length, 203 mm.

U.S.N.M. No. 59930. Port Jackson. D. G. Stead. Length, 52–77 mm. 6 examples.

U.S.N.M. No. 59931. Port Stephens, New South Wales. Length 89 to 105 mm. 6 examples.

Five examples. A.N.S.P. Victoria, Australia. Agnes F. Kenyon. 1909. Length, 153–176 mm.

Genus MACRURA Van Hasselt

Macrura Van Hasselt, Algemein Konst. Letterbode, vol. 21, p. 329, 1823. (Type, *Clupea kelee* Cuvier, monotypic. Reference not consulted.) (*Macroura* Meuschen, 1778, in mammals, *Macrourus* Bloch, 1786, in fishes, and *Macrurus* Schneider, 1801, in fishes, not involved.)

Hilsa Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 303, 1917. (Type, *Paralosa durbanensis* Regan, virtually.) (*Hilsa* Regan proposed to replace *Paralosa* Regan, 1916.)

Paralosa (not Bleeker) Regan, Ann. Durban Mus., vol. 1, pt. 3, p. 167, 1916. (Type, *Paralosa durbanensis* Regan, monotypic.)

Tenualosa Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1934. (Type, *Alosa reevesii* Richardson, orthotypic.)

Body compressed. Belly keeled, with scutes. Maxillary with rather wide supplemental bone. Premaxillaries meet at acute angle. No teeth. Gill rakers very numerous, long, slender. Pseudobranchiae present. Branchiostegals 5. Scales adherent. No enlarged scales at caudal base. Anal long. Ventrals below dorsal.

Coasts and rivers of East Africa from Natal to China. Young examples have deeper bodies and smaller heads than the adults, the latter largely due to the size of the opercle.

ANALYSIS OF SPECIES

a^1. Macrura. Parietal ridges expanded and striated; maxillary reaches ½ in eye or beyond; caudal long as head.
  b^1. Depth 2½ to 3.
    c^1. Head 3 to 3⅖ ---------- kelee
    c^2. Head 3⅗ to 3¾ ---------- durbanensis
  b^2. Depth 2¼; head 3⅗ ---------- brevis
a^2. Tenualosa. Parietal ridges narrow and covered by smooth skin with age.
    d^1. Maxillary reaches eye center (young) or beyond.
      e^1. Caudal lobes long as head.
        f^1. Opercle ½ to ⅔ broad as deep; scales 45 to 48, transversely 17 to 20 ---------- ilisha
        f^2. Opercle ⅔ to ¾ broad as deep; scales 42 to 45, transversely 16 or 17 ---------- reevesii
      e^2. Caudal longer than head; opercle ½ to ⅔ broad as deep; scales 40, transversely 14 or 15 ---------- sinensis
    d^2. Maxillary not reaching middle of eye; caudal lobes much longer than head; scales 45, transversely 14 or 15 ---------- macrura

Subgenus MACRURA Van Hasselt

Parietal ridges expanded and striated. Maxillary reaches halfway in eye or beyond. Caudal long as head.

MACRURA KELEE (Cuvier)

Clupea kelee CUVIER, Règne animal, ed. 2, vol. 2, p. 320, 1829 (on *Kelee* Russell, Fishes of Coromandel, vol. 2, p. 75, pl. 195, upper figure, 1803, type locality: Vizagapatam).

Clupeonia blochii VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 353, 1847 (type locality: Tranquebar).

Hilsa blochii FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 30, No. 4, p. 3, 1926 (Bombay); List Fish. Malaya, p. 27, 1938 (reference).

Alausa kanagurta BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, pp. 13, 34, 1852 (type locality: Batavia, Muntok, East Indies); Nederland. Tijdschr. Dierk., vol. 2, pp. 35, 176, 1865 (Siam).

Alosa kanagurta BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 114, pl. (7) 265, fig. 5, 1866–72 (Java, Sumatra, Banka).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 590, 1912 (Batavia).—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 480, 1924 (Singora).—SUVATTI, Index Fish. Siam, p. 9, 1937 (Bang Plasoi; Sakon Nakhon).

Clupea kanagurta DAY, Fishes of India, pt. 4, p. 640, pl. 162, fig. 4, 1878 (Sind, India); Fauna British India, Fishes, vol. 1, p. 377, 1889.—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, No. 2, p. 355, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e^ note, pp. 118, 120, 1929 (Cochin China, Saigon, Mekong).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 111, 1931 (Panipahan).

Clupea (Alosa) kanagurta WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 67, 1913 (Batavia).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1^e^ note, p. 8, 1926 (Ponompenh).

Hilsa kanagurta REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 304, 1917 (Zanzibar to Malay Archipelago).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 86, 1934 (Bangkok); vol. 87, p. 90, fig. 8, 1935 (Bangkok).—SUVATTI, Index Fish. Siam, p. 12, 1937 (reference).—FOWLER, List Fish. Malaya, p. 27, 1938 (reference).

Harengula kanagurta PARADICE and WHITLEY, Mem. Queensland Mus., vol. 9, p. 76, pl. 12, fig. 1, 1927 (Sir Edward Pellew Group).—McCULLOCH, Australian Mus. Mem., vol. 5, p. 39, 1929 (reference).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 17, fig. 13, 1929 (Amoy).

Alausa ilisha (not Buchanan-Hamilton) BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 33, 1852 (Batavia, in sea).—KNER, Reise *Novara*, Fische, p. 331, 1865 (Ceylon).

Clupea ilisha GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 445, 1868 (Java, Zanzibar, Pinang).—DAY, Fishes of India, pt. 4, p. 640, 1878 (part); Fauna British India, Fishes, vol. 1, p. 376, 1889 (part).

Alosa chapra (not gray) GÜNTHER, Fishes of Zanzibar, p. 123, 1866 (Aden, Zanzibar).

Alosa malayana BLEEKER, Nederland. Tijdschr. Dierk., vol. 3, p. 294, 1866 (type locality: Java; Sumatra); Atlas Ichth. Ind. Néerland., vol. 6, p. 114, pl. (7) 265, fig. 4, 1866–72 (Java, Madura, Sumatra).

Depth 2¾ to 2⅘; head 3 to 3⅒, width 2 to 2¼. Snout 3⅗ to 4⅛ in head from snout tip; eye 4⅛ to 4¼, 1 to 1⅛ in snout, 1⅛ to

1⅕ in interorbital, adipose lids broadly cover eye; maxillary reaches ½ to ¾ in eye, expansion 1⅔ to 2 in eye, length 2⅛ to 2⅖ in head from snout tip; front of upper jaw with median notch; no teeth; interorbital 3⅓ to 4⅛, slightly elevated, level medianly; cheek as measured from hind maxillary end to preopercle ridge twice deep as long; cheek, preopercle, occiput and humeral region strongly venulose. Gill rakers 50+95 to 130, setiform, equal eye; gill filaments 2¼ in gill rakers.

Scales 38 or 39 in median lateral series to caudal base and 5 more on latter; 13 transverse, 10 to 15 predorsal. Abdominal serrae 18+13. Ventral with axillary scale ⅗ of fin. Scales with wide-set transverse vertical striae, variously complete; circuli as fine parallel vertical striae, none on cutaneous apical portion which with horizontal, parallel, marginal grooves.

D. III, 15, I or III, 14, I, first branched ray 1⅞ to 2 in total head length; A. III, 18, I, first branched ray 3⅔ to 4¾; caudal 1 to 1⅛, deeply forked, slender lobes ending in narrow points; least depth of caudal peduncle 3 to 3⅕; pectoral 1½ to 1¾; ventral 2½ to 3.

Back and occiput brownish, body otherwise white, with bright silvery reflections. Rounded dusky or neutral black humeral blotch about size of pupil, followed by row of 4 or 5 paler and less distinct smaller spots at same level and well spaced, but none beyond dorsal fin. Dorsal and caudal pale brownish, former narrowly blackish apically. Lower fins whitish.

Aden, Zanzibar, India, Ceylon, Siam, Pinang, East Indies.

U.S.N.M. No. 72499. Batavia, Java. Bryant and Palmer. 1909. Length, 143–170 mm. 6 examples.

U.S.N.M. No. 72500. Batavia, Java. Bryant and Palmer. 1909. Length, 140–147 mm. 3 examples.

MACRURA DURBANENSIS (Regan)

Clupea durbanensis REGAN, Ann. Natal Gov. Mus., vol. 1, pt. 4, p. 4, pl. 4, 1906 (type locality: Durban Bay); vol. 1, pt. 3, p. 242, 1908 (Durban Bay).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 268, 1908–11 (Natal, Durban).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 59, 1913 (Natal).

Paralosa durbanensis REGAN, Ann. Durban Mus., vol. 1, p. 167, 1916 (Durban).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 297, 1917 (reference).

Hilsa durbanensis REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 305, 1917 (Natal).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 111, 1925 (Natal coast).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 195 (Delagoa Bay).—BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 1017, 1927 (Fowler's reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 411, 1934 (Natal); vol. 87, p. 365, 1935 (Durban beach).

Depth 2⅔ to 2⅘; head 3¼ to 4, width 2⅒ to 2⅖. Snout 3⅗ to 4 in head from snout tip; eye 3⅓ to 3½, adipose lid covers last

$2/5$ of eye; maxillary reaches $1/3$ in eye, $1/2$ in eye in young, expansion $1\frac{3}{4}$ to 2 in eye, length $2\frac{1}{4}$ to $2\frac{2}{5}$ in head from snout tip; upper jaw with median notch, less distinct with age; interorbital 4 to $4\frac{1}{2}$, nearly level; preorbital, suborbitals and opercle above venulose. Gill rakers 23+38, lanceolate.

Scales 35 or 36 in median lateral series to caudal base and 4 or 5 more on latter; 12 transversely, 14 or 15 predorsal. Abdominal scutes 16 to 18+13. Scales with 1 to 4 vertical striae; very fine circuli vertically parallel.

D. III, 14, I or III, 15, I, first branched ray $1\frac{2}{5}$ to $1\frac{3}{5}$ in total head length; A. III, 17 or III, 18, first branched ray $3\frac{2}{5}$ to $3\frac{2}{3}$; least depth of caudal peduncle $2\frac{1}{10}$ to $2\frac{3}{4}$; pectoral $1\frac{1}{4}$ to $1\frac{3}{5}$; ventral $2\frac{1}{8}$ to $2\frac{1}{4}$; caudal 3 in combined head and body to caudal base, equals head in young.

Back and head above, olivaceous, below silvery white. Iris silvery. Fins pale. Dorsal edge above and hind caudal edge dusky.

Portuguese East Africa and Natal.

A.N.S.P. 53059 to 53061. Durban, Natal. 1927. H. W. Bell Marley. Length, 123-132 mm.

A.N.S.P. 53159 to 53162. Delagoa Bay. Portuguese East Africa. H. W. Bell Marley. July 1923. Length, 95–168 mm.

MACRURA BREVIS (Bleeker)

Alosa brevis BLEEKER, Journ. Indian Arch., vol. 2, p. (633)638, 1848 (type locality: Bima, Sumbawa Island); Atlas Ichth. Ind. Néerland., vol. 6, p. 116, 1866–72 (copied).

Hilsa brevis FOWLER, Mem. Bishop Mus., vol. 10, p. 30, 1928 (compiled).

Alausa brachysoma (not *Sardinella brachysoma* Bleeker) BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 5, p. 527, 1853 (type locality: Padang, Sumatra).

Alosa brachysoma BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 115, pl. (4) 262, fig. 5, 1866–72 (Sumatra).

Hilsa brachysoma REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 305, 1917 (Sumatra).

Clupea platygaster GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 448, 1868 (Bleeker's Sumatran example).—REGAN, Trans. Zool. Soc. London, vol. 20, pt. 6, p. 276, 1914 (Mimika River, New Guinea).

Clupea (Alosa) platygaster WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 66, fig. 24, 1913 (Tjilatjap and Dirk de Vries Bay).—CHEVEY, Inst. Océanogr. Indochine, 19^{e} note, p. 9, 1932 (Cochin China; Cambodia; Laos).

Alosa platygaster ROXAS and MARTIN, Dept. Agri. Comm. Manila Tech. Bull. 6, p. 21, 1937 (reference).

Depth $2\frac{1}{2}$; head $3\frac{2}{5}$. Snout long as eye, which 4 in head; maxillary reaches beyond eye center; opercle width $2/5$ its depth; parietal ridges expanded and striated. Lower gill rakers 100.

Scales 42 in medial lateral series; 15 transversely. Ventral scutes 17+12.

D. 17 or 18; A. 20 to 21; caudal long as head; ventrals below middle of dorsal.

A dark humeral spot. Dorsal and caudal with dark edges. Length, 120 mm. (Regan.)

East Indies.

Subgenus TENUALOSA Fowler

Parietal ridges narrow and covered by smooth skin with age. Maxillary variable. Caudal lobes equal or longer than head.

MACRURA REEVESII (Richardson)

FIGURE 17

Alosa reevesii RICHARDSON, Ichth. China Japan, p. 305, 1846 (type locality: Chinese Seas).

Alausa reevesii VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 437, 1847 (Macao).—SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 5, p. 107, 1881 (Swatow).

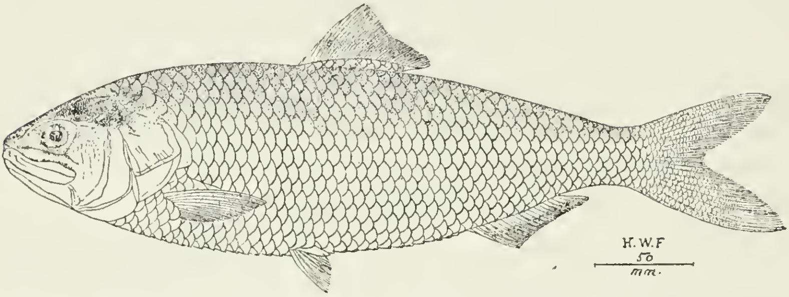

FIGURE 17.—*Macrura reevesii* (Richardson): U.S.N.M. No. 57621, from "Japan" (probably China).

Clupea reevesii GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 446, 1868 (type; China).—PETERS, Monatsb. Akad. Wiss. Berlin, 1880, p. 926 (Ningpo).—GÜNTHER, Ann. Mag. Nat. Hist., ser. 6, vol. 4, pp. (219) 229, 1889 (Kiu Kiang).—ELERA, Cat. Fauna Filip., vol. 1, p. 583, 1895 (Luzon, Cavite, Santa Cruz).—RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 64.

Hilsa reevesii REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 306, 1917 (Shanghai and Kiu Kiang).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1934 (reference).—KIMURA, Journ. Shanghai Sci. Inst., sect. 3, vol. 3, p. 104, 1935 (Ting Ming, Yantze-Kiang).

Alausa palasah (not Cuvier) RICHARDSON, Ichth. China Japan, p. 306, 1846 (China Sea).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 282, 1849 (on Richardson's specimen).

Clupea palasah GÜNTHER, Cat. Fishes British Mus., vol. 1, p. 445, 1868 (copied).

Depth 3¼; head 3⅖, width 2½. Snout 4 in head; eye 6⅖, 1¾ in snout, 1¾ in interorbital, adipose lids largely cover eye; maxillary reaches opposite hind eye edge, expansion 1⅕ in eye, length 2⅓ in head; front of upper jaw with deep median notch; interorbital 4⅓, convexly elevated; preopercle twice deep as long, with some vertical parallel venules, others on top of head, bones of head otherwise largely smooth. Gill rakers 115+180, fine, setiform, 5 in head; gill filaments 4/5 gill rakers.

Scales 40 in median lateral series to caudal base and 5 more on latter; 15 transversely, 18 predorsal. Abdominal serrae 18+14. Axillary ventral scale 2/3 length of fin. Caudal apparently without alar scales. Scales with 9 or 10 transverse waved convex striae; circuli fine, vertically parallel, apically without circuli but with many horizontal parallel grooves to cutaneous uneven edge.

D. IV, 15, I, first branched ray 2¼ in head; A. III, 16, I, first branched ray 5; caudal 1⅛, deeply forked, lobes rather slender and lower apparently longer; least depth of caudal peduncle 3¼; pectoral 1⅔; ventral 3.

Back and upper surfaces of head olivaceous. Sides and lower surface slivery whitish. Iris pale or whitish. Dorsal creamy basally and apically, with horizontal broad diffuse dusky or gray-brown transfusion. Caudal brownish. Pectoral creamy, terminally deep brown. Anal and ventral whitish.

China. Reported from the Philippines by Elera.

U.S.N.M. No. 57621. "Japan" [doubtless China]. P. L. Jouy. Length, 385 mm., caudal ends broken.

MACRURA SINENSIS (Linnaeus)

Clupea sinensis LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 319, 1758 (type locality: China); ed. 12, vol. 1, p. 525, 1766 (copied).—BONNATERRE, Tableau Encyclop. Ichth., p. 188, 1788 (China).—GMELIN, Syst. Nat. Linnaeus, vol. 1, p. 1408, 1789 (China).—WALBAUM, Artedi Pisc., vol. 3, p. 40, 1792 (copied).—BLOCH, Naturg. ausländ. Fische, vol. 9, p. 38, pl. 405, 1795 (East Indies, Japan, Tranquebar).—FORSTER, Fauna Indica, p. 16, 1795.—SCHNEIDER, Syst. Ichth. Bloch, p. 424, 1801 (China).

Clupea (Alausa) sinensis MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 405, 1876 (Sambas, Borneo).

Clupanodon sinensis LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 468, 471, pl. 11, fig. 2, 1803 (Asia; not America).

Hilsa sinensis FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 592 (Shanghai), p. 598, 1930 (Hong Kong; note); vol. 85, p. 246, 1934 (reference); List Fish. Malaya, p. 28, 1938 (reference).

Alausa toli VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 435, 1847 (type locality: Coromandel, Pondicherry).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1281, 1849 (Pinang, Malay Peninsula, Singapore).

Alosa toli BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 113, pl. (8) 265, fig. 4, 1866–72 (Java, Sumatra, Pinang, Singapore, Banka).

Clupea toli GÜNTHER, Cat. Fishes Brit. Mus., vol. 7, p. 447, 1868 (East Indies).—DAY, Fishes of India, pt. 4, p. 641, pl. 162, fig. 2, 1878 (Bombay, India); Fauna British India, Fishes, vol. 1, p. 377, 1889.—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 186, 1904 (Kuala Lumpur).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6e note, p. 119, 1929 (Cochin China).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 110, 1931 (Bagan Si Api Api); vol. 15, livr. 3, p. 231, 1936 (Padang, Tikarbay, Borneo).

Clupea (*Alausa*) *toli* Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 405, 1876 (Bangkok).

Clupea (*Alosa*) *toli* Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 64, 1913 (Bagan Api Api, Sumatra).—Chevy, Inst. Océanogr. Indo-Chine, 19ᵉ note, p. 9, Aug. 25, 1932 (Cochin China; Cambodia).

Sardinella toli Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 166, 1902 (Kotosho, Formosa).—Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 166, 1909 (Takao).

Hilsa toli Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 306, 1917 (India, Malay Peninsula and Archipelago).—Hora, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 174, 1923 (Nontaburi).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 12, 1937 (Sumatra coast 100 miles west of Singapore).

? Clupea macroura (Kuhl and Van Hasselt) Valenciennes, Hist. Nat. Poiss., vol. 20, p. 437, 1847 (name only) (type locality: Java).

Alausa ctenolepis Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 74, 1852 (type locality: Batavia, Muntok, Singapore).

Clupea chapra (not Buchanan-Hamilton) Günther, Cat. Fishes British Mus., vol. 7, p. 447, 1868 (Bengal).

Alosa ilisha (not Buchanan-Hamilton) Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 148, 1874 (compiled).

Depth 2⅔ to 3¼; head 3½ to 4. Snout long as or longer than eye, which 4⅓ to 7½ in head; maxillary reaches below hind part of eye or beyond; opercle width from ½ to nearly ⅔ its depth; parietal ridges narrow, covered with smooth skin with age. Lower gill rakers 70 to 95.

Scales 40 in medial lateral series; 14 or 15 transversely. Ventral scutes 17 or 18+11 to 13.

D. 17 to 19; A. 18 to 21; caudal lobes with age nearly 1½ as long as head; ventrals below middle of dorsal.

Length 450 mm. (Regan.)

India, Malay Peninsula, Singapore, Pinang, East Indies, Siam, Formosa, China.

MACRURA MACRURA (Bleeker)

Alausa macrurus (Kuhl and Van Hasselt) Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 31, 1852 (type locality: Batavia, Java).

Alosa macrurus Bleeker, Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 64, 1861 (Pinang); Atlas Ichth. Ind. Néerland., vol. 6, p. 113, pl. (6) 264, fig. 4, 1866–72 (Java, Sumatra, Bancalis, Singapore, Borneo); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 294, 1868 (Rio, Bintang).

Clupea macrura (Kuhl and Van Hasselt) Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 31, 1852 (name in synonymy).—Günther, Cat. Fishes British Mus., vol. 7, p. 448, 1868 (type).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 619, 1926 (Sarawak).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 119, 174, 1929 (Cochin China).—Hardenberg, Treubia, vol. 13, livr. 1, p. 111, 1931 (Bagan Si Api Api).

Clupea (*Alosa*) *macrura* Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 65, 1913 (Bagan Api Api, Sumatra).—Chevey, Inst. Océanogr. Indo-Chine, 19ᵉ note, p. 9, 1932 (Indo-China).

Hilsa macrura Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 307, 1917 (Sunda Islands).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1934 (reference); List Fish. Malaya, p. 27, 1938 (reference).

Depth 2⅔ to 3¼; head 4 to 4⅔. Snout not longer than diameter of eye, which 4 to 5 in head; maxillary reaches ⅓ in eye; opercle width ½ its depth; parietal ridges narrow, covered with smooth skin with age. Lower gill rakers 60 to 80.

Scales 45 in medial lateral series; 14 or 15 transversely. Ventral scutes 16 to 18+11 to 15.

D. 17 to 20; A. 18 to 21; caudal lobes with age nearly twice long as head; ventrals below middle or front part of dorsal.

Length, 350 mm. (Regan.)

East Indies.

MACRURA ILISHA (Buchanan-Hamilton)

Clupanodon ilisha Buchanan-Hamilton, Fishes of Ganges, pp. 243, 382, pl. 19, fig. 73, 1822 (type locality: Ganges estuaries, Patua, Goyakarra, Calcutta, Dhasa).

Alausa ilisha Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1282, 1849 (compiled).—Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 33, 1852 (part).—Kner, Reise *Novara*, Fische, p. 331, 1865 (Ceylon).

Clupea ilisha Günther, Cat. Fishes British Mus., vol. 7, p. 445, 1868 (part).—Day, Fishes of India, pt. 4, p. 640, pl. 172, fig. 3, 1878 (Tigris, Sind, India, Burma); Fauna British India, Fishes, vol. 1, p. 376, fig. 115, 1889.—Lloyd, Rec. Indian Mus., vol. 1, p. 221, 1907 (Akyab).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 118, 1929 (Cochin China).

Clupea (Alosa) ilisha Steindachner, Ann. Hofmus. Wien, vol. 11, p. 228, 1896 (Rangoon).

Hilsa ilisha Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 306, 1917 (Persian Gulf to Burma).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1934 (reference).

Clupea palasah Cuvier, Règne animal, ed. 2, vol. 2, p. 320, 1829 [on *Palasah* Russell, Fishes of Coromandel, vol. 2, p. 77, pl. 198, 1803 (type locality: Vizagapatam)].—Günther, Cat. Fish. Brit. Mus., vol. 7, p. 445, 1868 (Ganges and Cochin).

Alausa palasah Valenciennes, Hist. Nat. Poiss., vol. 20, p. 432, 1847 (Bombay; Pondicherry).—Jerdon, Madras Journ. Lit. Sci., vol. 15, p. 345, 1849.—Day, Fishes of Malabar, p. 235, 1865.

Clupea (Alosa) palasah Steindachner, Ann. Hofmus. Wien, vol. 11, p. 229, 1896 (Rangoon).

Depth 2½ to 3; head 3¼ to 3¾. Snout long as or longer than eye, which 4⅔ to 7 in head; maxillary reaches below hind part of eye or beyond; opercle width from little more than ½ to ⅔ its depth; parietal ridges narrow, covered with smooth skin with age. Lower gill rakers 120 (young) to 220.

Scales 45 to 48 in medial lateral series; 17 to 20 transversely. Ventral scutes 17 to 19+13 or 14.

D. 18 to 20; A. 18 to 21; ventrals below front part of head; caudal about long as head. Vertebrae 47.

Length, 350 mm. (Regan.)

Persian Gulf, India, Ceylon, Burma.

Genus GUDUSIA Fowler

Gudusia Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 207. (Type, *Clupanodon chapra* Buchanan-Hamilton, orthotypic.)

Distinguished from *Hilsa* by its very small scales, which 80 to 120 in a median lateral series. Gill rakers very numerous, 200 or more on lower part of first arch.

Two species in the rivers of India and Burma.

ANALYSIS OF SPECIES

a^1. Depth $2\frac{2}{3}$ to $3\frac{1}{5}$; head $2\frac{4}{5}$ to $3\frac{1}{2}$; A. III, 20 to 22 ---------------- chapra
a^2. Depth $2\frac{1}{2}$; head $3\frac{2}{3}$; A. III, 21 to 26 -------------------------- variegata

GUDUSIA CHAPRA (Buchanan-Hamilton)

Clupanodon chapra Buchanan-Hamilton, Fishes of Ganges, pp. 248, 383, 1822 (type locality: Upper Ganges River).

Alosa chapra Gray, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 92, fig. 2, 1832–34 (Indian Ocean).

Alausa chapra Valenciennes, Hist. Nat. Poiss., vol. 20, p. 439, 1847 (on Gray).

Clupea chapra Günther, Cat. Fishes British Mus., vol. 7, p. 447, 1868 (Bengal).—Day, Proc. Zool. Soc. London, p. 385, 1869 (Orissa); Fishes of India, pt. 4, p. 639, pl. 161, fig. 1, 1878 (Sind, India south to Kistua River); Fauna British India, Fishes, vol. 1, p. 375, 1889.

Sardinella chapra Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 207 (Ganges River).

Gudusia chapra Regan, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 307, 1917 (Northern India, Sind to Assam).—Fowler, List Fish. Malaya, p. 26, 1938 (reference).

Clupea indica Gray, Illustr. Indian Zool., Hardwicke, vol. 2, pl. 91, figs. 1–2x, 1832-34 (type locality: India).—Günther, Cat. Fishes British Mus., vol. 7, p. 444, 1868 (Ganges, Assam, Cachar).

Clupea champil Gray, Illustr. Indian Zool., Hardwicke, vol. 2, pl. 91, figs. 5–6, 1834 (no type locality given=India).

Pellona champil Valenciennes, Hist. Nat. Poiss., vol. 20, p. 324, 1847 (compiled).

Alausa champil Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1284, 1849 (Pinang).

Alausa microlepis Valenciennes, Hist. Nat. Poiss., vol. 20, p. 439, 1847 (type locality: Bengal).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. (74) 146, 1853 (Calcutta).

Clupea suhia Chaudhuri, Rec. Indian Mus., vol. 7, p. 436, pl. 38, fig. 1, 1912 (type locality; River Gandak in Saran, Bihar).

Depth 3 to $3\frac{1}{5}$; head $2\frac{4}{5}$ to $3\frac{1}{2}$. Snout $4\frac{1}{3}$ to 5 in head from upper jaw tip; eye $3\frac{1}{6}$ to $4\frac{1}{3}$; maxillary $2\frac{4}{7}$ to 3; interorbital 4 to 6.

Scales 78 to 85 in medial lateral series to caudal base and 5 more on latter; 27 to 32 scales transversely; 28 predorsal scales. Ventral scutes 19, rarely 18 or 20+9, seldom 10.

D. III, 13, I, rarely III, 12, I; A. III, 20, I, rarely III, 22, I.

India, Assam, Pinang.

6 examples. A.N.S.P. Ganges River, India. Dr. Marmaduke Burrough. Length, 70 ?–165 mm.

GUDUSIA VARIEGATA (Day)

Clupea variegata DAY, Proc. Zool. Soc. London, 1869, p. 623 (type locality: Irrawaddi River, Burma); Fishes of India, pt. 4, p. 639, pl. 161, fig. 4, 1878 (Irrawaddi); Fauna Brit. India, Fishes, vol. 1, p. 375, 1889.—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 9, 1889, p. 350, 1890 (Irrawaddi).—LLOYD, Rec. Indian Mus., vol. 1, p. 221, 1907 (Akyab).—JENKINS, Rec. Indian Mus., vol. 5, p. 138, 1910.

Gudusia variegata REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 308, 1917 (Burma).—MYERS, Amer. Mus. Nov., No. 150, p. 1, 1924 (Burma).—PRASHAD and MUKERJI, Rec. Indian Mus., vol. 31, pt. 3, p. 209, 1929 (Namsanda stream and Namkawng chaung at Kamaing, Burma).

Depth 2⅓; head 3⅔. Snout 5 in head from snout tip; eye 5, subequal with snout, with broad adipose lids; maxillary reaches ½ in eye, expansion 1¾ in eye, length 2⅓ in head; teeth absent, or only very minute ones on tongue; interorbital equals eye, moderately high; opercles smooth.

Scales 90 in median lateral series; 35 transversely; larger on belly. Ventral scutes 18+10.

D. III or IV, 12 or 13, first branched ray 1⅗ in head; A. III, 21 to 26, fin base 1¼, first branched ray 4⅔; caudal 3¼ in rest of body, deeply forked; least depth of caudal peduncle 2⅖ in head; pectoral 1⅓; ventral 2½.

Silvery, glossed with gold and bronze. A dark humeral spot. Row of 18 transverse dark bars across back, descend short way over sides. Dorsal with black band in lower portion of posterior half. End of tail tipped with black. Length, 178 mm. (Day.)

Burma, in rivers.

Genus KOWALA Valenciennes

Kowala VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 362, 1847. (Type, *Clupea kowal* RÜPPELL, tautotypic.)

Clupeoides BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 1, p. 274, 1850. (Type, *Clupeoides borneensis* Bleeker, monotypic.)

Body oblong, compressed, abdominal profile usually more convex than dorsal profile. Ventral scutes prominent. Teeth in jaws, on palatines, vomer and pterygoids. Scales firm, thin. One anal. Ventral origin before or below dorsal origin.

ANALYSIS OF SPECIES

a^1. CLUPEOIDES. Dorsal origin midway between snout tip and caudal base; maxillary reaches ½ in eye.
  b^1. Depth 4 or more; head 4 to 4⅗; lateral line 39 to 42.
    c^1. A silvery lateral band; upper caudal lobe tipped black; abdominal scutes 10+7; D. 12 to 14; A. 21 ________ papuensis
    c^2. No silvery lateral band; caudal with black margin; abdominal scutes 9+9; D. 15 or 16; A 16 to 18 ________ borneensis
    c^3. No silvery lateral band; tips of caudal lobes dark gray; abdominal scutes 10 or 11+9 or 10; D. 14 or 15; A. 17 to 19 ________ exile

*b*². Depth less than 4; head 3½ to 3¾; lateral line 35 to 37 ---- hypselosoma

*a*². Kowala. Dorsal origin nearer snout tip than caudal base; a silvery lateral band; D. 15 or 16; A. 18.

*d*¹. Depth 2⅗ to 2⅘; eye 3½ in head; maxillary scarcely reaches eye; 8 postventral scutes ---- venulosus

*d*². Depth 2⅔ to 3; eye 3 in head; maxillary reaches ½ in eye; 11 postventral scutes ---- coval

Subgenus Clupeoides Bleeker

KOWALA PAPUENSIS (Ramsay and Ogilby)

Corica papuensis Ramsay and Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 1, p. 19, 1886 (type locality: Strickland River, New Guinea).

Clupeoides papuensis Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 60, 1913 (compiled).—Fowler, Mem. Bishop, Mus. vol. 10, p. 31, 1928 (compiled); vol. 11, No. 5, p. 315, 1931 (Strickland River materials).

Body compressed, elongate; head 5⅖ in total. Snout 2 in eye; eye 2⅚ in head; maxillary reaches ½ in eye; interorbital ⅔ of eye.

Scales 40 in medial lateral series; 10 transversely. Abdominal scutes 12+7.

D. 12 to 14, origin midway between snout tip and caudal base, rather behind ventral bases; A. 21, begins far behind dorsal end, without detached rays; caudal forked, lobes equal; pectoral rays 11; ventral rays 8; vertebrae 43.

Silvery, occiput and broad longitudinal band steel blue. Tip of upper caudal lobe blackish. Length, 91 mm. (Ramsay and Ogilby.)

New Guinea. Type in Australian Museum.

KOWALA BORNEENSIS (Bleeker)

Clupeoides borneensis Bleeker, Nat. Tijds. Nederland. Indië, vol. 1, p. (260) 275, 1850 (type locality: Bandjermassing, Borneo); vol. 2, p. 417, 1851 (Sambas); Verh. Batav. Genootsch. (Haring.), vol. 24, p. 17, 1852 (Bandjermassing); Act. Soc. Sci. Néerland., vol. 2, No. 6, p. 4, 1857 (Kahajan, Borneo); Atlas Ichth. Ind. Néerland., vol. 6, pl. (4) 262, fig. 2, 1866-72.—Günther, Cat. Fish. Brit. Mus., vol. 7, p. 452, 1868 (type).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 60, 1913 (compiled).—Hardenberg, Treubia, vol. 14, livr. 2, p. 218, 1933 (Musi R.); vol. 15, livr. 3, p. 230, 1936 (Kapuas R., Borneo).

Clupea (*Clupeoides*) *borneensis* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 100, 1866-72 (Borneo).

Depth 3¾; head 4½, width 2⅓. Snout 3¾ in head from snout tip; eye 3¾ subequal with snout; maxillary reaches ¼ in eye, length 2½ in head from upper jaw tip; minute teeth in jaws, on vomer, palatines and pterygoids; interorbital ⅔ to ¾ of eye, low.

Scales 40 to 42 in median lateral series, 10 or 11 transversely. Ventral scutes 9+9.

D. III, 13, first branched ray 1⅓ in head; A. III, 14 or 15, first branched ray 2¼; caudal 4⅛ in rest of body, well forked; least depth of caudal peduncle 1⅞ in head; pectoral 1½; ventral 1⅘.

Green above, side and below silvery white. No silvery lateral band. Iris yellowish or rosy. Fins hyaline yellowish, caudal with blackish posterior margin. Length 80 mm. (Bleeker.)

Borneo, in rivers.

KOWALA EXILE (Fowler)

Clupeoides exilis FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 92, fig. 12, 1935 (type locality, Bangkok, Siam); vol. 89, p. 131, 1937 (Bangkok; Tachin).

Depth 4 to 4½; head 3⅓ to 3¾, width 2⅕ to 2¼. Snout 4 to 4⅓ in head from snout tip; eye 3 to 3½, greater than snout or interorbital; maxillary reaches ⅕ to ¼ in eye, length 2⅓ to 2⅔ in head from snout tip; teeth not evident; interorbital 4⅕ to 4½, low, slightly convex. Gill rakers 13+23, lanceolate, 1⅖ in eye; gill filaments ¾ of gill rakers.

Scales 30 or 31 in lateral series from shoulder to caudal base and 2 or 3 more on latter; 10 scales transversely at dorsal origin; 13 or 14 predorsal scales. Caudal base scaly. Scales with 4 to 6 basal, marginal, slightly radiating striae; circuli 45 to 50 basally, not extended apically. Abdominal scutes 10 or 11+9 or 10.

D. III, 11, I or III, 12, I, first branched ray 1¼ to 1⅓ in total head length; A. III, 14, I to III, 16, I, first branched ray 1¾ to 2; caudal 1 to 1⅛, deeply forked, lobes sharp pointed; least depth of caudal peduncle 2⅕ to 2¼; pectoral 1⅕ to 1⅖, rays I, 10; ventral rays I, 7, fin 1⅞ to 2 in total head length.

Very pale brown to whitish generally. Back above with scattered dark gray dots, few also at end of snout and on cranium more distinct. Iris whitish, turning gray in alcohol. Fins pale or whitish with gray on front edge of dorsal and upper and lower edges of caudal, also tip of each caudal lobe usually dark gray.

Siam. With much the appearance of *Corica*.

A.N.S.P. No. 60508. Bangkok, Siam. May 1934. R. M. de Schauensee. Length, 65 mm. Type.

A.N.S.P. Nos. 60509–60518 and 61476–61488. Bangkok, Siam. May 1934. R. M. de Schauensee. Length, 46–58 mm. Paratypes.

KOWALA HYPSELOSOMA (Bleeker)

Clupeoides hypselosoma BLEEKER, Nederland. Tijdschr. Dierk., vol. 3, p. 293, 1866 (type locality: Bandjermassing, Borneo).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 451, 1868 (type).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (2)250, fig. 5, 1866–72.—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 59, 1913 (compiled).

Clupea (*Clupeoides*) *potamophilus* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 101, 1866–72 (type locality: Borneo).

Depth 3; head $3\frac{3}{5}$, width 2. Snout $3\frac{2}{5}$ in head; eye $2\frac{7}{8}$, slightly greater than snout; maxillary reaches about $\frac{1}{5}$ in eye, length 2 in head; minute teeth in jaws, on vomer, palatines, and pterygoids; interorbital $\frac{2}{3}$ to $\frac{3}{4}$ of eye, low.

Scales 35 in median lateral series; 9 or 10 transversely. Ventral scutes 12+8 (description gives but 11).

D. III, 12, first branched ray about $\frac{9}{10}$ of head; A. III, 13, first branched ray $2\frac{9}{10}$; caudal $3\frac{1}{4}$ in rest of body, well forked; least depth of caudal peduncle 2 in head; pectoral $1\frac{1}{4}$; ventral 2.

Above green, sides yellowish silvery, below silvery. No silvery lateral band. Iris yellowish. Fins hyaline yellowish or yellow. Caudal without dusky or blackish margin. Length, 57 mm. (Bleeker.)

Borneo, in rivers.

Subgenus Kowala Valenciennes

KOWALA VENULOSUS (Weber and Beaufort)

Clupeoides venulosus Weber and Beaufort, Verh. Akad. Wet. Amsterdam, vol. 17, p. 3, 1912 (type locality: Lorentz River, Dutch New Guinea); Fishes Indo-Australian Archipelago, vol. 2, p. 58, 1913 (type).

Depth $3\frac{1}{2}$; head $4\frac{1}{5}$ to $4\frac{7}{10}$. Snout little shorter than eye, which $3\frac{1}{2}$ in head; maxillary reaches nearly or quite opposite front eye edge, nearly 4 in head; premaxillary with very fine teeth, also fine curved series in lower jaw; teeth on tongue, minute on vomer, not on palatines; interorbital little less than eye, very convex. Gill rakers 17, coarse, much shorter than gill filaments, shorter than pupil.

Scales 38 to 40 in medial lateral series; 12 transversely; surfaces with reticulations. Ventral scutes 12 to 14+8.

D. 14, height equals head without snout; A. 18, base nearly long as head, longest ray nearly equals postorbital; caudal deeply forked, inside lobes convex; pectoral long as head without snout; ventrals $\frac{1}{5}$ shorter, origin $\frac{2}{3}$ eye diameter before dorsal.

Yellowish brown on back, otherwise more silvery, with broad metallic blue lateral band. Fins hyaline. Caudal with exception of hind border, dusted dark. Length, 120 mm. (Weber and Beaufort.)

Dutch New Guinea, in fresh water.

KOWALA COVAL (Cuvier)

Clupea coval Cuvier, Règne animal, ed. 2, vol. 2, p. 318, 1829 [on *Kowal* Russell, Fishes of Coromandel, vol. 2, p. 170, pl. 186, upper figure, 1803 (type locality: Vizagapatam)].

Clupea kowal Rüppell, Neue Wirbelth., Fische, p. 79, 1835 (Djedda and Massaua).—Günther, Cat. Fishes British Mus., vol. 7, p. 450, 1868 (part).

Clupea (*Harengula*) *kowal* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 109, 1866–72 (copied Canton).

Harengula kowal Fowler, List Fish. Malaya, p. 26, 1938 (reference).

Kowala thoracata VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 363, 1847 (type locality: Pondicherry).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1278, 1849 (Pinang).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 145. 1851.—REGAN, Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 588, 1922 (Kurrachee to New Guinea).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 86, 1934 (Bangkok); vol. 87, p. 90, fig. 9, 1935 (Packnam; Bangkok); vol. 89, p. 130, 1937 (Bangkok; Tachin).—SUVATTI, Index Fish. Siam, p. 9, 1937 (reference).

Clupea (*Harengula*) *thoracata* WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 78, 1913 (compiled).

Meletta lile VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 378, 1847 (type locality: Malabar, Coromandel, Pondicherry).

Clupea lile GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 450, 1868 (compiled).—DAY, Fishes of India, pt. 4, p. 638, pl. 162, fig. 1, 1878 (India, Burma): Fauna British India, Fishes, vol. 1, p. 374, 1889.—LLOYD, Rec. Indian Mus., vol. 1, p. 221, 1907 (Akyab).—TIRANT, Service Océanogr. Pêches Indo-China, 6^e note, pp. 30, 117, 174, 1929 (Hué).

Clupeoides lile WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 57, fig. 22, 1913 (Batavia, Samarang).—FOWLER, Mem. Bishop Mus., vol. 10, p. 31, 1928 (compiled).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 110, 1931 (Bagan Si Api Api).—CHEVEY, Inst. Océanogr. Indochine, 19^e note, p. 9, 1932 (Cochinchina).—HERRE, Fishes Herre Philippine Exped., 1931, p. 14, 1934 (Unisan; Dumaguete).—ROXAS, Philippine Journ. Sci., vol. 55, p. 270, pl. 2, fig. 7, 1934 (Luzon; Panay).—HARDENBERG, Treubia, vol. 15, livr. 3, p. 230, 1936 (Pontianak; Telok Pekadai).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 22, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 11, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 12, 1937 (Singapore).—FOWLER, List Fish. Malaya, p. 25, 1938 (reference).

Alausa champil (not Gray) CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1284, 1849 (Pinang).

Rogenia argijrotaenia BLEEKER, Nat. Tijds. Nederland. Indië, vol. 3, p. 457, 1852 (type locality: Muntok and Batavia).

Rogenia argyrotaenia BLEEKER, Nederland. Tijdschr. Dierk., vol. 2, p. 176, 1865 (Siam; compiled).—KNER, Reise *Novara*, Fische, p. 328, 1865 (Java, Ceylon, Tahiti).

Clupea argyrotaenia GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 423, 1868 (Java).—ELERA, Cat. Fauna Filip., vol. 1, p. 582, 1895 (Luzon, Cavite, Santa Cruz).

Clupea (*Clupeoides*) *argyrotaenia* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 101, 1866–72 (Java, Pinang, Singapore, Banka).

Clupea (*Leiogaster*) *argyrotaenia* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (6) 262, fig. 5, 1866–72.

Harengula chrysotaenia JORDAN and SEALE, Bull. Bur. Fisher., vol. 25, 1905, p. 187, 1906 (compiled reference, wrongly written in place of *Rogenia argyrotaenia* Kner).

? *Clupea huae* TIRANT, Service Océanogr. Pêches Indochine, 6^e note, pp. 29, 118, 174, 1929 (type locality: Hué).

Clupeoides hueensis CHEVEY, Inst. Océanogr. Indochine, 19^e note, p. 9, 1932 (type locality: Annam) (on Tirant).

Depth 2⅔ to 3; head 4 to 4¼. Snout 3⅘ in head from snout tip; eye 3 to 4¼, larger than snout, with broad adipose lids; maxillary reaches about 1/5 in eye, length 1 7/8 in head from snout tip; teeth on vomer, palatines, pterygoids and tongue; interorbital low. Gill rakers about 32, somewhat longer than gill filaments, shorter than half of eye.

Scales 38 to 41 in medial lateral series; 10 or 11 transversely; firm, smooth, border rounded and irregularly crenulated. About 16 predorsal bony scutes (shown by Regan to be ends of supraneural bones projecting); ventral scutes 19+10.

D. III, 12 or 13, first branched ray 1 1/2 in total head length; A. III, 14 to 16, first branched ray 2 1/2; caudal 3 7/8 in rest of body, well forked; least depth of caudal peduncle 2 in head; pectoral 1 1/4; ventral 1 7/8.

Yellowish. Head, abdomen, and median lateral band silvery. Two rows of black dots along back. Black dots on end of snout, top of head and in row along each side of base of anal. Caudal dotted with black, dots more crowded at margin. Length, 90 mm. (Weber and Beaufort.)

India, Ceylon, Burma, Siam, Pinang, Singapore, Java, Banka, China.

10 examples. Sebatic Island, Borneo. October 1, 1909. Length, 50–55 mm.

Genus POTAMALOSA Ogilby

Potamalosa OGILBY, Proc. Linn. Soc. New South Wales, vol. 4, pt. 3, 1896, p. 504, 1897. (Type, *Potamalosa novae-hollandiae* (not Valenciennes) Ogilby= *Clupea richmondia* Macleay.)

Body oblong, strongly compressed. Eye moderate, adipose lids little developed. Mouth oblique, lower jaw projecting. Maxillary broad. Teeth in jaws, on palatines and tongue, vomer and pterygoids toothless. Suborbital longer than deep. Gill rakers moderate, rather short, stout, serrulate. Pseudobranchiae rather small. Branchiostegals 8 or 9.

Scales moderate, adherent, free edge rounded, entire. Bases of caudal and paired fins scaly. Elongate scale in ventral axil. Dorsal scutes prominent, not so strong as those of abdomen, which begin on front of throat. Vertebrae 46. Dorsal fin inserted well before middle of body. Anal rays 18 or less. Caudal forked. Pectorals small, pointed, rays 16 or 17. Ventral rays 8, fin inserted below front fourth of dorsal.

POTAMALOSA RICHMONDIA (Macleay)

Clupea richmondia MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, pt. 3, p. 380, 1880 (type locality: Richmond River, New South Wales); vol. 6, p. 259, 1881 (reference).—OGILBY, Cat. Fishes New South Wales, p. 56, 1886 (compiled).

Clupea richmondi KENT, Great Barrier Reef, p. 370, 1893 (Queensland).

Potamalosa richmondia Regan, Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 589, 1922 (no locality).—McCulloch, Austral. Mus. Mem., vol. 5, p. 40, 1929 (reference).

Meletta novae-hollandiae Valenciennes, Hist. Nat. Poiss., vol. 20, p. 376, 1847 [type locality: Port Jackson (Quoy and Gaimard)].—Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 189, 1872 (Melbourne market).—? Kent, Great Barrier Reef, p. 370, 1893 (Queensland).

Clupea novae hollandiae Günther, Cat. Fishes British Mus., vol. 7, p. 431, 1868 (New South Wales, Hawkesbury River).—Macleay, Proc. Linn. Soc. New South Wales, vol. 4, pt. 3, p. 378, 1880 (Hawkesbury and Nepean Rivers); vol. 6, p. 259, 1881 (reference).—Ogilby, Cat. Fishes New South Wales, p. 56, 1886.—Kent, Great Barrier Reef, p. 307, 1893.

Diplomystus novaehollandiae Ogilby, Edible Fishes New South Wales, p. 184, pl. 47, 1893.

Potamalosa novae hollandiae Roughley, Fishes of Australia, p. 17, 1916 (coastal rivers New South Wales, Victoria, South Queensland).—McCulloch, Rec. Australian Mus., vol. 11, pt. 7, p. 166, pl. 29, fig. 4, 1917; Fishes of New South Wales, ed. 2, p. 16, pl. 5, fig. 53a, 1927.—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (Kent's Queensland record questioned).

Hyperlophus spratellides (not Ogilby) Regan, Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 590, 1922 (type of *Meletta novae-hollandia* Valenciennes).

Depth 2⅘ to 3⅘; head 3¾ to 4½, width 1⅘ to 2. Snout 3⅗ in head from snout tip; eye 2⅞, greater than snout or interorbital, adipose lid covers last third of eye with age; maxillary reaches ¼ to ⅓ in eye, expansion 2¾ to 3⅗ in eye, length 2½ in head from snout tip; teeth obsolete or absent; interorbital 4⅛ to 4⅕, slightly elevated, level medianly; cranium and humeral region venulose. Gill rakers 11+24, lanceolate, equal gill filaments, which ½ of eye.

Scales 37 to 40 in median lateral series to caudal base and 4 or 5 more on latter; 11 or 12 transversely, 14 predorsal; 10 or 11 predorsal keels. Abdominal serrae 17 or 18+14 or 15. Scales with 9 to 18 basal radiating striae; 3 or 4 incomplete vertical striae or as short marginals above and below; circuli as very fine parallel vertical striae, none apical.

D. iii, 12, i or 13, i, first branched ray 1⅓ to 1⅖ in total head length; A. iii, 13, i, first branched ray 2⅓ to 2⅖; caudal 3⅔ to 4 in rest of body, deeply forked, slender lobes sharply pointed; least depth of caudal peduncle 2⅛ to 2⅞ in total head length; pectoral 1¼ to 1⅓; ventral 1½ to 1⅘.

Back brown, also occiput. Sides and lower surfaces silvery white. Dorsal and caudal pale brownish. Lower fins whitish. Iris silvery white.

Queensland, New South Wales, Victoria.

U.S.N.M. No. 47805. "Fiji Islands" [Introduced ?] Australian Museum. Length, 180 mm.

U.S.N.M. No. 47806. "Fiji Islands" [Introduced ?] Australian Museum. Length, 166 mm., caudal ends broken.

U.S.N.M. No. 48802. Nepean and Hunter Rivers, New South Wales. Length, 200–205 mm. 4 examples.

U.S.N.M. No. 59878. Richmond River, New South Wales. D. G. Stead. 1904. Length, 131–243 mm. 3 examples.

Genus HYPERLOPHUS Ogilby

Hyperlophus Ogilby, Rec. Australian Mus., vol. 2, pt. 2, p. 26, 1892. (Type, *Clupea spratellides* Ogilby.)

Omochetus Ogilby, Proc. Linn. Soc. New South Wales, vol. 22, p. 72, 1897. (Type, *Hyperlophus copii* Ogilby, orthotypic.)

Body oblong or elongate, more or less compressed. Eye rather large, adipose lid much less developed forward. Mouth oblique, lower jaw protruding. Maxillary wide. Band of small teeth along middle of tongue. Suborbital longer than deep. Gill rakers slender, serrulate. Branchiostegals 4. Scales moderate, adherent, free edges rounded and pectinated. Caudal base scaly. Elongate scale in ventral axil. Dorsal serrae feeble, less developed than abdominal serrae which begin at front of throat. Vertebrae 47. Dorsal median. Anal moderate, low, rays 19 or more. Caudal forked. Pectoral small, obtusely pointed, rays 16. Ventral small, inserted before dorsal, rays 8.

Australia.

ANALYSIS OF SPECIES

*a*¹. Anal origin behind end of depressed dorsal; scales persistent______ vittatus

*a*². Anal origin close behind base of last dorsal ray; scales deciduous. translucidus

HYPERLOPHUS VITTATUS (Castelnau)

Meletta vittata Castelnau, Victorian Offic. Record Philadelphia Exhib. (Res. Fishes Australia), p. 46, 1875 (type locality: Melbourne, Victoria).

Clupea vittata Macleay, Proc. Linn. Soc. New South Wales, vol. 4, p. 379, 1880 (copied); vol. 6, p. 259, 1881 (reference).—Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 37, 1890 (reference).

Hyperlophus vittatus McCulloch, Rec. Australian Mus., vol. 11, pt. 7, p. 163, pl. 29, figs. 1–2, 1917 (Moreton Bay).—Waite, Rec. South Australian Mus., vol. 2, No. 1, p. 39, fig. 56, 1921.—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—McCulloch, Fishes New South Wales, ed. 2, p. 16, pl. 4, fig. 52a, 1927; Australian Mus. Mem., vol. 5, p. 40, 1929 (reference).

Meletta novae hollandiae (not Valenciennes) Castelnau, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 189, 1872 (Melbourne market).

Clupea spratellides Ogilby, Rec. Australian Mus., vol. 2, pt. 2, p. 24, 1892 (type locality: Parramatta River, New South Wales).

Hyperlophus spratellides Ogilby, Commercial Fish Fisher. Queensland, p. 47, 1915 (Brisbane); Mem. Queensland Mus., vol. 5, p. 98, 1916 (Queensland coasts).

Hyperlophus copii Ogilby, Proc. Linn. Soc. New South Wales, vol. 22, p. 72, 1897 (type locality: New South Wales coast [Maroubra]); Ann. Queensland Mus., No. 9, p. 5, 1908 (Southport, Queensland).—Ogilby, Proc. Roy. Soc. Queensland, vol. 21, p. 24, 1908 (Mud Island).

Depth 4¼ to 4⅔; head 3⅘ to 4⅛, width 2⅛ to 2⅗. Snout 3⅖ to 3½ in head from snout tip; eye 3 to 3½, greater than snout in young to 1⅛ with age, greater than interorbital at all ages; maxillary reaches ⅛ to ⅕ in eye; expansion 1⅗ to 2 in eye, length 2¼ to 2⅓ in head from snout tip; no median notch at front of upper jaw; no teeth; interorbital 5⅛ to 6, little convex; sides above and top of head, also humeral region, venulose. Gill rakers 9+26, compressed, lanceolate, length 1¼ in eye; gill filaments ¾ gill rakers.

Scales 49 or 50 in median lateral series to caudal base and 4 or 5 more on latter; 13 transversely, 20 to 24 predorsal; 23 to 27 predorsal scutes. Abdominal scutes 20+12 or 13. Axillary ventral scale ½ fin length. Scale with single median vertical stria; usually 2 or 3 more marginal short basal striae; circuli very fine, in vertical parallel series, none apical where cutaneous edge fringed.

D. iii, 9, first branched ray 1⅖ to 1½ in total head length; A. iii, 11, i, first branched ray 3⅛ to 3¼; caudal 1, deeply forked, broad lobes pointed; least depth of caudal peduncle 2⅒ to 2¼; pectoral 1½ to 1⅔; ventral 2 to 2⅛.

Back brownish, sides and below whitish, with silvery sheen. Dorsal and caudal pale brownish, grayish terminally. Lower fins whitish. Iris whitish, gray in formalin.

Queensland, New South Wales, Victoria, South Australia.

U.S.N.M. 48827. Maroubra, New South Wales. J. D. Ogilby. Length, 80–90 mm. 2 examples. Paratypes of *Hyperlophus copii* Ogilby.

U.S.N.M. 59946. Port Stephens, New South Wales. 1905. D. G. Stead. Length, 68–101 mm. 10 examples.

HYPERLOPHUS TRANSLUCIDUS McCulloch

Hyperlophus translucidus McCulloch, Rec. Australian Mus., vol. 11, pt. 7, p. 165, pl. 29, fig. 3, 1917 (type locality: Sans Souci, Botany Bay, New South Wales); Fishes New South Wales, ed. 2, p. 16, 1927; Australian Mus. Mem., vol. 5, p. 40, 1929 (reference).

Depth $3\frac{9}{10}$; head 4⅛. Snout 3⅗ in head from snout tip; eye 3, greater than snout, narrow adipose lid posteriorly; maxillary reaches ⅓ in eye, length 2½ in head from snout tip; no teeth except minute line of minute teeth on tongue; interorbital low.

Scales very deciduous, lacking in type. Dorsal scutes 19; abdominal 17+9.

D. 15 or 16, origin midway between snout tip and caudal base, first branched ray 1⅗ in total head length; A. 19 to 22, origin close behind base of last dorsal ray, first branched ray 2¾; caudal 4 in rest of body, forked; least depth of caudal peduncle 2⅗ in head; pectoral $1\frac{9}{10}$; ventral 2⅓, inserted before dorsal.

Translucent in life, with broad silvery band from head to caudal. Back with some scattered blackish dots which extend to dorsal and caudal. Lips and chin also dotted. Occiput dark brown. Dark spot at base of each anal ray. Length 58 mm. (McCulloch.)

New South Wales.

Genus CORICA Buchanan-Hamilton

Corica Buchanan-Hamilton, Fishes of Ganges, pp. 253, 383, 1822. (Type, *Corica soborna* Buchanan-Hamilton, monotypic.)

Clupeichthys Bleeker, Nat. Tijds. Nederland. Indië, vol. 9, p. (260) 274, 1855. (Type, *Clupeichthys goniognathus* Bleeker, monotypic.)

Body elongate or partly elongate, belly little compressed. Back rounded. Teeth on jaws, palatines, and tongue. Gill rakers 19 to 22. Branchiostegals 6. Scales moderate, thin, smooth or nearly so. Dorsal rays 13 to 16. Anal rays grouped as two fins, second fin formed by two thickened rays, cleft to base and much longer than last rays of first anal fin. Ventral origin below dorsal origin.

Small herrings of the rivers and shores of India and the East Indies, known by the presence of two anal fins.

ANALYSIS OF SPECIES

a^1. Corica. Mouth normal; teeth very minute; gill rakers about 22, slender, elongate.
  b^1. Dorsal rays 14 or 15.
    c^1. Scales 40 to 42; scutes 10 or 11 before ventrals; dorsal origin midway between front eye edge and caudal base ---------------------- soborna
    c^2. Scales 38; scutes 7 or 8 before ventrals; dorsal origin nearer snout tip than caudal base ---------------------- perakensis
  b^2. Dorsal rays 13 or 14; dorsal origin midway between front eye edge and caudal base.
    d^1. Scales 36; scutes 9 or 10 before ventrals ---------------------- bleekeri
    d^2. Scales 32 to 34; scutes 10 or 11 before ventrals ---------------------- laciniata
a^2. Clupeichthys Premaxillary prominent, forms blunt angle with rather convex, ascending maxillary, beyond margin of which protrude points of rather long teeth; gill rakers short, thick ---------------------- goniognathus

Subgenus Corica Buchanan-Hamilton

CORICA SOBORNA Buchanan-Hamilton

Corica soborna Buchanan-Hamilton, Fishes of Ganges, pp. 253, 283, 1822 (type locality: Mahanada River).—Günther, Cat. Fishes British Mus., vol. 7, p. 452, 1868 (note).—Day, Proc. Zool. Soc. London, 1869, p. 385.—Day, Fishes of India, pt. 4, p. 642, pl. 162, fig. 5, 1878 (Arissa and Bengal); Fauna British India, Fishes, vol. 1, p. 378, fig. 116, 1889.—H. M. Smith, Journ. Nat. Hist. Soc. Siam, vol. 9, p. 85, 1933 (Bangpakong R.).—Suvatti, Index Fish, Siam, p. 9, 1937 (Maenam Bang Plasoi).

Clupea sobarna Gray, Illustr. Indian Zool. Hardwicke, vol. 2, 1832 (Buchanan-Hamilton's fig.).

Corica guborni Gray, *op. cit.*, pl. 91, figs. 7, 8,

Pellona soborni Valenciennes, Hist. Nat. Poiss., vol. 20, p. 325, 1847 (on Gray).

Corica argentata Swainson, Nat. Hist. Animals, Fishes, vol. 2, p. 294, 1839 (on Buchanan-Hamilton).

Spratella pseudopterus Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 432, 1852 (type locality: Pamangkat, southwest Borneo).

Clupeoides pseudopterus Günther, Cat. Fishes British Mus., vol. 7, p. 452, 1868 (type).—Vaillant, Nouv. Arch. Mus. Hist. Nat., Paris, ser. 3, vol. 5, p. 100, 1893.

Corica pseudopterus Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 98, pl. (2) 260, fig. 3, 1866–72 (Borneo).—Regan, Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 589, 1922 (type of *Corica pseudopterus*).—Hardenberg, Treubia, vol. 13, livr. 3–4, p. 412, fig. 2, 1931 (Bandjermasin, Moesi R., Padang Tikarbay); vol. 15, livr. 3, p. 230, 1936 (Kapuas R., Borneo).—Chevey, Inst. Océanogr. Indochine, 19^e note, p. 9, 1932 (river at Saigon).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 12, 1937 (Singapore).

Corica (*Corica*) *pseudopterus* Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 54, 1913 (types).

Depth 4; head 4¼. Snout 4 in head from upper jaw tip; eye 3¼, slightly larger than snout; maxillary reaches about ⅕ in eye, length 2⅖ in head; interorbital ⅔ of eye, low. (Gill rakers 22, conspicuously longer than gill filaments and pupil—Weber and Beaufort.)

Scales 40 to 42 in median lateral series, 10 transversely. Ventral scutes 10 or 11+7 or 8.

D. iii, 12 or 13, first branched dorsal ray 1⅕ in total head, origin slightly behind ventral origin; A. ii, 12 or 13+2, first branched ray 2 in head; caudal 3⅓ in rest of body, forked in hind third and lower lobe longer; least depth of caudal peduncle 2 in head; pectoral 1⅛; ventral 1⅛.

Silvery, with light band. Length, 50 mm. (Day.)

India, Borneo. Possibly the East Indian form may be different, though there is little in the description on which to separate it.

CORICA PERAKENSIS Herre

Corica perakensis Herre, Bull. Raffles Mus., No. 12, p. 5, pl. 1, 1936 (type locality: Perak River, Perak).—Herre and Myers, Raffles Mus. Bull. No. 13, p. 12, 1937 (types).—Fowler, List Fish. Malaya, p. 247, 1938 (reference).

Depth 4⅖ to 4½; head 3⅘ to 3⁹⁄₁₀. Snout 3⅓ to 3⅗ in head; eye 3, longer than snout; maxillary reaches opposite front margin of pupil, length 2⅕ to 2⅗ in head. Gill rakers 6+16, longest less than pupil and much shorter than gill filaments.

Scales 38 in lateral series, very deciduous. Abdominal scutes 7 or 8+4 to 6, of former rarely 6 have spines or usually only last 2 bear spines, and postventral with larger and more prominent spines.

D. 14 or 15, origin nearer snout tip than caudal base, fin base 5⁷⁄₁₀ in length, height 7⅒ or 5½ in some specimens; A. 15+2, fin base 6⅓ in length, fin height 8⅕; pectoral little less than head without snout, 6 to 6⅓ in length; ventral origin beneath fifth dorsal ray, fin length 2⅕ to 2⅖ in head.

Color in formalin yellowish, with broad white band from shoulder to middle of tail. Nape stippled with black dots. Similar black dots along bases of dorsal and anal and may extend on to caudal. Some specimens with lateral row of black dots on middle of caudal peduncle. Fins colorless except caudal, which may be speckled with black dots.

Length, 22–28.5 mm. (Herre.)

Malaya.

CORICA BLEEKERI Hardenberg

Corica bleekeri HARDENBERG, Treubia, vol. 15, livr. 3, p. 229, 1936 (type locality: Middle course of Kapuas River, Borneo).

Depth 4, body elongate, compressed; head 4. Eye 3 in head, equals snout or postorbital; maxillary reaches somewhat beyond front margin of eye, somewhat more than twice in head; hardly conspicuous ridge each side of vertex.

Scales 35 or 36 in lateral series; 9 transversely. Abdominal scutes 9 or 10+5. Ventral profile more convex than dorsal, which almost straight. Vertebrae 35 or 36.

D. 13 or 14, origin midway between front eye edge and caudal base, somewhat more than twice head; A. 14 to 16+2, first anal ⅔ of head and second anal remote from first; pectoral rays 12, fin ¾ of head; ventral rays 8, origin below third or fourth dorsal ray, somewhat shorter than snout and eye.

Silvery, fins hyaline. A black spot on occiput. Two very faint dotted lines on back behind dorsal.

Length, mature at 35 mm., series 18–45 mm. (Hardenberg.)

East Indies. Differs from *Corica soborna* in fewer dorsal rays, fewer abdominal scutes and fewer lateral scales.

CORICA LACINIATA Fowler

Corica laciniata FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 92, fig. 11, 1935 (type locality: Bangkok, Siam; Paknam); vol. 89, p. 131, 1937 (Bangkok; Paknam; Tachin).

Depth 4 to 4¾; head 3⅔ to 3¾, width 2¼ to 2½. Snout 3½ to 4 in head from snout tip; eye 3 to 3⅕, greater than snout or interorbital; maxillary reaches ⅓ to ⅗ in eye, expansion 2 in eye, length 2⅓ to 2⅖ in head from snout tip; apparently no teeth; interorbital 4 to 5½, low, slightly convex. Gill rakers 11+21, 1⅓ in eye; gill filaments ⅔ of gill rakers.

Scales 30 or 31 in lateral series from shoulder to caudal base and 2 or 3 more on latter; 10 scales transversely at dorsal origin, 14 or 15 predorsal scales. Caudal base scaly. Scales with 12 to 14 well contrasted, marginal, straight, basal striae, group above and below axis each with parallel striae so their angles would converge; basal circuli 35 to 38, obsolete apically. Abdominal scutes 10 or 11+8 or 9.

D. III, 11, I, first branched ray 1⅖ to 1⅗ in total head length; A. III, 11+2 or III, 12+2, first branched ray 2⅗ to 2⅔; caudal 1 to 1⅛, forked, lobes pointed; least depth of caudal peduncle 2⅕ to 2⅔; pectoral 1½ to 1⅔, rays I, 10; ventral rays I, 7, fin 1⅞ to 2 in total head length.

Color pale to whitish, fading pale brown in alcohol. Back above with dark spots or dots. Iris whitish. Dorsal and caudal dusted with dark gray.

Siam. Its distinctions are set forth in the above analysis of species. Greatly like *Corica bleekeri.*

A.N.S.P. No. 61415. Bangkok, Siam. May 1934, R. M. de Schauensee. Length, 65 mm. Type.

A.N.S.P. Nos. 61416–61457 and 60519 to 60551. Bangkok, Siam. May 1934. R. M. de Schauensee. Length, 46–53 mm. Paratypes.

Two examples. A.N.S.P. Paknam, Siam. May 1934. R. M. de Schauensee. Length, 52–58 mm.

Subgenus CLUPEICHTHYS Bleeker

CORICA GONIOGNATHUS (Bleeker)

Clupeichthys goniognathus BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 9, p. (260)275, 1855 (type locality: Lahat, Sumatra).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 453, 1866 (type).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (6) 264, fig. 1, 1866–72.—VAILLANT, Notes Leyden Mus., vol. 24, p. 31, 1902.—REGAN, Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 589, 1922 (type of *Clupeichthys goniognathus*).

Corica goniognathus BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 97, 1866–72 (Sumatra).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 55, fig. 21, 1913.—HARDENBERG, Treubia, vol. 15, livr. 3, p. 230, 1936 (middle course of Kapuas R., Borneo).

Corica (*Clupeichthys*) *goniognathus* WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 55, 1913 (Rivers of East Sumatra; Kapuas River tributaries).

Depth 3⅞ to 4; head 4 to 4½. Snout 3 in head from snout tip; eye 3¾, $1\frac{1}{10}$ in snout; maxillary reaches ¼ in eye, length 2⅛ in head from snout tip, lower border convex, with submarginal rather long teeth, only points prominent beyond that margin; forms blunt angle with horizontally prominent premaxillary which forms with its counterpart rounded upper border with small median incisure; thick, symphyseal part of mandible not surpassing snout tip; small teeth on vomer, palatines, pterygoids and tongue; interorbital less than eye, convex. Gill rakers 19, finely serrulated, shorter than gill filaments, which somewhat shorter than pupil.

Scales 39 or 40 in medial lateral series, 10 transversely; hind edges rounded, entire. Ventral scutes 10+8.

D. III, 12 or 13, first branched ray 1¼ in total head; A. III, 13 or 14+2, first branched ray 2⅓ in head; caudal 4⅗ in rest of body, well forked; least depth of caudal peduncle 2 in head; pectoral 1⅖; ventral 1¾.

Yellowish, point and top of head and back with dark tips. Opercles silvery. Caudal dusted with black, margin blackish. Fins otherwise hyaline. Length, nearly 90 mm. (Weber and Beaufort.)

Sumatra, Borneo.

Genus PELLONA Valenciennes

Pellona VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. (218) 300, 1847. (Type, *Pellona orbignyana* Valenciennes, designated by Gill, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 38.)

Neosteus NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 17, 1923. (Type, *Pellona ditchela* Valenciennes, designated by Norman, Zool. Record, Pisces, 1923, p. 25.)

Edge of upper jaw with small toothed bone (ligament in *Ilisha*) extending from lateral end of premaxillary to prominent middle of maxillary. Scales usually with 1 or 2 vertical striae, sometimes several others incomplete. Dorsal origin before anal.

A small group usually associated with *Ilisha* but differing chiefly in the structure of the upper jaw. Norman proposed *Neosteus* for this group, apparently overlooking Gill's designation of the type of *Pellona* in 1861. Besides the only Indo-Pacific species described below, Norman admits 7 others, all American.

PELLONA DITCHELA Valenciennes

Pellona ditchela VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. (228) 314, 1847 [on *Ditchelee* Russell, Fishes of Coromandel, vol. 2, p. 72, pl. 188, 1803 (type locality: Vizagapatam)].—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 72, 1853 (reference).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 454, 1868 (reference).—DAY, Fishes of India, pt. 4, p. 644, pl. 165, fig. 5, 1878 (Madras, Coromandel); Fauna British India, Fishes, vol. 1, p. 381, 1889.—WHITLEY, Rec. Australian Mus., vol. 16, p. 214, 1928 (Edward Pellew Group, Gulf of Carpentaria).—FOWLER, List Fish. Malaya, p. 30, 1938 (reference).

Ilisha ditchela FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1923, p. 36 (Tananarive, Madagascar).

Neosteus ditchela NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 17, 1923 (types of *Ilisha hoevenii;* East Africa; Indo-Australian Archipelago).—MCCULLOCH, Australian Mus. Mem., vol. 5, p. 41, 1929 (reference).

? *Clupea melastoma* SCHNEIDER, Syst. Ichth. Bloch, p. 427, 1801 (type locality: Indian Ocean at Coromandel coast).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 454, 1868 (copied).

Pellona melastoma VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 308, 1847 (Pondicherry).

Pellona hoevenii BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 21, 1852 (type locality: Batavia, Java); Nederland. Tijdschr. Dierk., vol. 2, p. 176, 1865 (Siam).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 455, 1868 (type: Amboina).—DAY, Fishes of India, pt. 4, p. 644, pl. 165, fig. 6, 1878

(Coromandel); Fauna British India, Fishes, vol. 1, p. 382, 1889.—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 86, fig. 29 (maxillary), 1913 (Batavia, Macassar, Pare Pare).—Barnard, Ann. South African Mus., vol. 21, pt. 2, p. 1016, 1927 (Natal coast, Delagoa Bay).

Pellona hoeveni Weber, *Siboga* Exped., vol. 57, Fische, p. 7, 1913 (Lombok and Saleyer).—Suvatti, Index Fish. Siam, p. 11, 1937 (reference).

Pellona hoeweni Chabanaud, Service Océanogr. Pêches Indo-Chine, 1^e note, p. 9, 1926 (Annam coast).

Ilisha hoevenii Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 117, pl. (11) 269, fig. 2, 1866-72 (Java, Sumatra, Singapore, Celebes, Halmaheira, Obi Major, Amboina, Ceram).—Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang, Sumatra).—Jordan and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 5, 1907 (Cavite).—Evermann and Seale, Bull. Bur. Fisher., vol. 26 (1936), p. 54, 1907 (San Fabian).—Jordan and Richardson, Bull. Bur. Fisher., vol. 27 (1907), p. 236, 1908 (Manila).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 210 (Padang example); Copeia, No. 58, p. 62, 1918 (Philippines); Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 195 (Delagoa Bay and Natal); vol. 79, p. 258, 1927 (Orion; Philippines).—Roxas, Philippine Journ. Sci., vol. 55, p. 283, pl. 2, fig. 9 (scale), 1934 (Luzon; Mindoro Masbate; Leyte; Panay; Guimaras).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 19, 1937 (reference).

Ilisha hoeveni McCulloch, Mem. Queensland Mus., vol. 7, pt. 4, p. 241, 1922 (between Cairns and Rockhampton).—Herre, Fishes Herre Philippine Exped. 1931, p. 14, 1934 (Manila).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 12, 1937 (Sumatra coast 100 miles west of Singapore).

Ilisha hoevennii McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).

Pellona natalensis Gilchrist and Thompson, Ann. South African Mus., vol. 6, p. 202, 1908-11 (type locality: 24 fathoms South Head Tugela River, north by west 4½ miles).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 110, pl. 7, fig. 1, 1925 (Natal coast, in 25 fathoms).

Ilisha natalensis Gilchrist, Marine Biol. Rep., South Africa, No. 1, p. 60, 1913 (Natal).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, pt. 4, p. 298, 1917 (reference).

Ilisha indica (not Swainson) Boulenger, Catalogue fresh water fishes Africa, vol. 1, p. 163, fig. 130, 1909.

Depth 2¾ to 3¼; head 3⅛ to 3½, width 2⅙ to 2¾. Snout 3¼ to 3¾ in head from snout tip; eye 2⅕ to 3⅛, greater than snout or interorbital, lid narrow; maxillary reaches ⅖ to ½ in eye, expansion 2 to 2⅕ in eye, length 1⁹⁄₁₀ to 2 in head from snout tip; front edge of upper jaw scarcely notched medially; teeth uniserial on jaw edges, minute, also some on lower maxillary edge; vomer and palatines toothless, broad patch of minute teeth on each pterygoid, few on tongue; interorbital 5 to 7½, level; preorbital, cheek, opercle and top of head posteriorly with venulose striae. Gill rakers 12 or 13+21 to 27, lanceolate, ½ of eye; gill filaments 2⅖ in eye.

Scales 36 to 39 in median lateral series to caudal base and 4 or 5 more on latter; 11 or 12 scales transversely, predorsal 14? to 16. Abdominal serrae 16 to 20+7 or 8. Scales with 2 complete and 5 imperfect median transverse striae; circuli very fine, vertically parallel.

D. II or III, 13 to III, 16, I, first branched ray 1⅗ to 1¾ in total head length; A. II or III, 31, I, to 38, I, first branched ray 2⅕ to 3; least depth of caudal peduncle 2⅘ to 3; pectoral 1⅗ to 1⅔; ventral 3⅓ to 3½; caudal 2⁹⁄₁₀ to 3⅓ in rest of body.

Back dusted brown, sides and below silvery white. Iris white. Snout end and mandible dusted with dull dusky. Dorsal and caudal grayish, other fins white.

East Africa, Delagoa Bay, Natal, Madagascar, India, Siam, East Indies, Philippines, Queensland. It seems hardly doubtful but that *Pellona natalensis* Gilchrist and Thompson is the present species. My South African materials all seem to agree, likewise the Madagascar example I recorded as *Ilisha ditchela*. According to Day that species has abdominal serrae 23+10, while the Madagascar example shows but 19+8. The species is, however, closely allied to *Ilisha hoevenii* in the structure of its maxillary.

1 example. Baganga Bay. May 15, 1908. Length 74 mm. In poor preservation.
15184 Busin Harbor, Burias Island. March 7, 1909. Length, 157 mm.
8851. Catbalogan, Samar. April 15, 1908. Length, 103 mm.
22541, 22542. Dagupan, Luzon. March 18, 1908. Length, 94–100 mm.
13181 to 13183, 14149. Iloilo market. June 1, 1908. Length, 140–160 mm.
19401 to 19403. Iloilo market. March 28, 1908. Length, 102–115 mm.
7 examples. Manila market. April 20, 1909. Length, 122–145 mm. [1527].
5368. Oton market, Iloilo. March 30, 1908. Length, 109 mm.
5 examples. Tacloban market. July 25, 1909. Length, 58–70 mm.
11730, 11731, 11820, 11821. Sandakan market, Borneo. March 2, 1908. Length, 158–180 mm.
A 1015. Buka Buka Island, Celebes. November 20, 1909. Length, 115 mm.
U.S.N.M. No. 56072. San Fabian, Philippines. Bureau of Fisheries (4127). Length, 170 mm.
U.S.N.M. No. 56304. Cavite, Philippines. Dr. G. A. Lung. Length, 120–140 mm.
U.S.N.M. No. 72512. Palaboen Ratoe, Wynkops Bay, Java. October 1909. Bryant and Palmer. Length, 135 mm. As *Ilisha indica*.
3 examples. A.N.S.P. Padang, Sumatra. A. C. Harrison and H. M. Hiller. Length, 115–120 mm.
A.N.S.P. No. 42789. Philippine Islands. Commercial Museum Philadelphia. Length, 103 mm. "Tabang."
A.N.S.P. Nos. 53155, 53156. Delagoa Bay, Portuguese East Africa. July 1923. H. W. Bell Marley. Length, 77–165 mm.
A.N.S.P. Nos. 53076, 53077. Natal. H. W. Bell Marley. Length, 190–195 mm.
A.N.S.P. No. 53154. Natal. H. W. Bell Marley. 1925. Length, 180 mm.

Genus ILISHA Richardson

Ilisha (Gray) RICHARDSON, Ichth. China Japan, p. 306, 1846. (Type, *Ilisha abnormis* (Gray) Richardson, monotypic.)

Platygaster (not Latreille, 1809, Schilling, 1829, Duméril and Bibron, 1844) SWAINSON, Nat. Hist. Animals, vol. 2, p. 294, 1839. (Type, *Platygaster africanus* Swainson, designated by Swain, Proc. Acad. Nat. Sci. Philadelphia, 1882, p. 280.)

Zunasia JORDAN and METZ, Mem. Carnegie Mus., vol. 6, No. 1, p. 7, 1913. (Type, *Pristigaster chinensis* Basilewsky, orthotypic.)

Euplatygaster FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1934. (Type, *Pellona brachysoma* Bleeker, orthotypic.)

Body elongate, compressed. Abdomen with sharp median keel of scutes. Mouth moderate, terminal, lower jaw projecting. Maxillary with narrow basal and expanded terminal part; before narrow part ligament extends from premaxillary end to maxillary expansion; two supplemental maxillaries. Teeth in jaws minute; no canines; rasplike bands of teeth on palatines and pterygoids; elongate patch of teeth on tongue. Gill rakers not very numerous. Scales moderate; with irregularly paired transverse grooves, their inner ends separated by interspace. Dorsal rays 14 to 21. Anal rays 33 to 52, fin base 2½ to 3⅔ in body, origin just below or just behind dorsal.

Tropical Indo-Pacific, one species in the Eastern tropical Atlantic. The following imperfectly described species, differing greatly in the very small scales, may not belong in the genus:

ILISHA LESCHENAULTI (Valenciennes)

Pellona leschenaulti VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 311, 1847 (type locality: Pondicherry).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 459, 1868 (copied).

Pellona leschenaultii DAY, Fishes of India, pt. 4, p. 646, 1878 (copied); Fauna British India, Fishes, vol. 1, p. 383, 1889.

Ilisha leschenaultii NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 6, 1923 (compiled).

Depth nearly 4 in total length. Teeth distinct on premaxillaries and mandible; suborbital and opercle striated or venulose.

Scales 70 in medial lateral series, smooth, thin, without striae. D. 21; A. 42, low and long; pectoral very large, ray 17 and rounded terminally, reaches beyond ventral origin and latter 8 or 9 scales before dorsal origin; ventral rays 8; caudal 27.

Silvery with traces of 10 to 12 obscure longitudinal lines of grayish. Length, 510 mm. (Valenciennes.)

India. Only known from the dried type.

ANALYSIS OF SPECIES

a^1. EUPLATYGASTER. Scales less than 46 in medial lateral series; preventral scutes 16 to 20.
  b^1. Depth 2⅗ to 3⅕.
    c^1. A. 38 to 41, origin below last dorsal ray .... indica
    c^2. A. 45 to 49, origin just behind dorsal .... brachysoma
  b^2. Depth 3¾ to 4.
    d^1. Dorsal origin little nearer snout tip than caudal base; anal origin below hind part of dorsal .... kampeni
    d^2. Dorsal origin much nearer snout tip than caudal base; anal origin just behind dorsal .... motius

a^{2}. Ilisha. Scales more than 46 in medial lateral series; preventral scutes 20 to 28.

e^{1}. Anal origin below front half of dorsal.

f^{1}. Depth 3¼ to 3⅗.

g^{1}. Anal origin below first dorsal ray; maxillary not reaching ½ in eye-------------------- pristigastroides

g^{2}. Anal origin below first third of dorsal; maxillary reaches ½ in eye or beyond-------------------- amblyuroptera

f^{2}. Depth 4 to 4⅓-------------------- sladeni

e^{2}. Anal origin below hind half of dorsal.

h^{1}. Depth 3 to 3½.

i^{1}. A. 42; dorsal origin nearer caudal base than snout tip. novacula

i^{2}. A. 45 to 50; dorsal origin equidistant from snout tip and caudal base or nearer former.

j^{1}. Ventral scutes not prominent.

k^{1}. Ventral inserted little nearer pectoral base than anal origin.

l^{1}. Lower gill rakers 18 or 19; abdominal scutes 22+10 or 11-------------------- filigera

l^{2}. Lower gill rakers 21 to 23; abdominal scutes 24 to 27+10 to 13-------------------- xanthoptera

k^{2}. Ventral inserted midway between pectoral base and anal origin; lower gill rakers 19 to 21; abdominal scutes 20 to 23+8 to 10-------------------- melastoma

j^{2}. Ventral scutes prominent-------------------- macrogaster

h^{2}. Depth 3½ to 4; A. 44 to 52-------------------- elongata

Subgenus Euplatygaster Fowler

Scales less than 46 in medial lateral series. Preventral scutes 16 to 20.

ILISHA INDICA (Swainson)

Playgaster indicus Swainson, Nat. Hist. Animals, vol. 2, p. 294, 1839 [on *Ditchoce* Russell, Fishes of Coromandel, vol. 2, p. 74, pl. 192, upper fig., 1803 (type locality: Vizagapatam)].

Pellona indica Jerdon, Madras Journ. Lit. Sci., vol. 17, p. 145, 1851.—Day, Fishes of India, pt. 4, p. 644, pl. 164, fig. 4, 1878; Fauna British India, Fishes, vol. 1, p. 381, 1889.—Pfeffer, Fische Ost-Afrikas, p. 69, 1896.—Lloyd, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 618, 1926 (Sarawak).

Ilisha indica Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 118, pl. (1) 259, fig. 4, 1866–72 (Java, Sumatra, Singapore, Banka).—Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 591, pl. 75, fig. 3, 1912 (scale) (Batavia; Pelaboean Ratoe).—Norman, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 4, 1923 (India, Malay Peninsula, China).—Fowler, Journ. Bombay Soc. Nat. Hist., vol. 30, No. 1, p. 38, 1924 (Calicut); vol. 30, No. 4, p. 3, 1926 (Bombay).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 121, 174, 1929 (Cochin China).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, Jan. 20, p. 246, 1934 (reference); vol. 86, p. 86, 1934 (Bangkok); vol. 87, p. 94, fig. 13, 1935 (Bangkok); vol. 89, p. 131, 1937 (Tachin); List Fish. Malaya, p. 29, 1938 (reference).

Clupea melastoma (part) Cuvier, Règne Animal, ed. 2, vol. 2, p. 319, 1829 (on *Ditchoee* Russell).

Pellona ditchoa VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 313, 1847 (on *Ditchoee* Russell).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 455, 1868 (Java, Zanzibar, East Africa).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 88, 1913 (Batavia, Kendal Palabuan, Batu, Bagan Api Api).—CHEVEY, Inst. Océanogr. Indo-Chine, 19e note, p. 10, 1932 (Cochinchina).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 111, 1931 (Bagan Si Api Api).—HERRE, Fishes Herre Philippine Exped. 1931, p. 15, 1934 (La Paz).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 19, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 10, 1937 (Gulf of Siam; Sriracha).—HERRE and MEYERS, Raffles Mus. Bull., No. 13, p. 13, 1937 (Singapore).

Depth 2¾ to 2⅚; head 3⅕ to 3¾, width to 2 to 2½. Snout 3½ to 4⅓ in head from snout tip; eye 2½ to 3, greater than snout or interorbital, with adipose lids; maxillary reaches ⅓ in eye, with anterior ligament along front edge, expansion 2 to 2⅕ in eye, length 2 to 2⅕ in head from snout tip; teeth obsolete or absent; interorbital 5 to 6, little elevated, though slightly convex; suborbitals with rather coarse branch of venules from preorbital to postocular, few striae on preopercular flange below; opercle with 2 weak radiating striae. Gill rakers 12+22 to 24, slender, lanceolate, 2⅓ in eye; gill filaments ¾ gill rakers.

Scales 38 to 40 in median lateral series to caudal base and 4 more on latter; 13 transversely, 14 to 16 predorsal. Abdominal scutes 18 to 20+9 or 10. Scales firmly adherent, narrowly imbricated. Scales with 6 to 10 vertical evenly spaced parallel striae, half of which may be broken or incomplete medially; 23 to 25 marginal apical striae; circuli fine, vertically parallel.

D. III, 10 to III, 13 ?, first branched ray 1⅓ to 1¾ in total head length; A. II, 34 to III, 36, first branched ray 2⅞ to 3; caudal 1, strongly forked, slender lobes pointed; least depth of caudal peduncle 2⅓ to 3$\frac{1}{10}$; pectoral 1¼ to 1¾ ventral 1¾ to 4⅕.

Back pale brown to olivaceous, with median pale dusky streak, sides and below bright silvery white. Iris white. Dorsal and caudal dusted with gray, other fins pale or whitish.

East Africa, Zanzibar, India, Malay Peninsula, East Indies, China.

U.S.N.M. No. 72510. Batavia, Java. Bryant and Palmer. 1909. Length, 98–115 mm. 5 examples.

U.S.N.M. No. 72511. Batavia, Java. Bryant and Palmer. 1909. Length, 153–173 mm. 2 examples.

2 examples. A.N.S.P. Calicut, India. James Hornell. Length, 93–110 mm.

1 example. A.N.S.P. Bombay, India. Bombay Nat. Hist., Soc. Length, 250 mm.

ILISHA BRACHYSOMA (Bleeker)

Pellona brachysoma BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 22, 1852 (type locality: Batavia, Java).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 456, 1868 (type).—DAY, Fishes of India, pt. 4, p. 645, pl. 165, fig. 2, 1878; Fauna British India, Fishes, vol. 1, p. 382, 1889.—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 87, 1913 (compiled).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, No. 2, p. 355, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 121, 1929 (Cochinchina).—CHEVEY, Inst. Océanogr. Indochine, 19ᵉ note, p. 10, 1932 (Indo-China).

Ilisha brachysoma BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 118, pl. (11) 267, fig. 5, 1866–72 (Java, Sumatra, Singapore).—FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang); Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 210 (same material).—NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 3, 1923 (type; Malay Archipelago).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 71, p. 1, 1927 (Benkoelen, Sumatra).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 599 1930 (Hong Kong); vol. 85, p. 246, 1934 (reference); vol. 87, p. 94, 1935 (Bangkok; Paknam); List Fish. Malaya, p. 28, 1938 (reference).

Depth 2⅘, ventral profile much more convex than upper; head 3⅗, width 2⅖. Snout 4 in head from upper jaw tip; eye 2½, greater than snout or interorbital, adipose lids narrow; maxillary reaches ⅓ in eye, expansion 2 in eye, length 1⅚ in head from snout tip; teeth small, uniserial in jaws, slightly larger medianly; interorbital 6¼ in head from snout tip, slightly elevated, depressed. Gill rakers 14+16, slender, ½ of eye; gill filaments 2⅔.

Scales 38 (injured) in medial lateral series to caudal base and 5 more on latter; 9 transversely, 14 (pockets) predorsal. Caudal with minute scales basally. Ventral scutes damaged.

D. III, 14, origin midway between snout tip and last anal ray base, fin base 2⅖ in total head length; A. III, 44, I, origin about opposite base of last dorsal ray, fin base 2¾ in combined head and trunk to caudal base; caudal subequal with head, deeply forked; least depth of caudal peduncle 2⁹⁄₁₀; pectoral ?; ventral very small, inserted slightly before dorsal origin.

When fresh in arrack pale or dull olivaceous on back. Sides and lower surface silvery white. Iris silvery white. Dorsal and caudal grayish, other fins paler.

India, Singapore, East Indies, China. According to Norman reaches 190 mm. and the ventral scutes 18 to 20+7 or 8.

1 example. A.N.S.P. Padang, Sumatra. A. C. Harrison and H. M. Hiller. Length, 150 mm.

ILISHA KAMPENI (Weber and Beaufort)

Pellona kampeni WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol 2, p. 87, 1913 (type locality: Batavia, Java; Balikpapan, Borneo).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 618, 1926 (Santubong).—HARDENBERG, Treubia, vol. 14, livr. 2, p. 219, 1933 (Kumai; Muara Kebas, N. Borneo); vol. 15, livr. 3, p. 231, 1936 (Kapuas R., Borneo).—SUVATTI, Index Fish. Siam, p. 11, 1937 (Maenam Tapi below Bandon; Thale Sap Songkhla, Thale Noi).

Ilisha kampeni NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 5, 1923 (Madras).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1934 (reference).

Depth 3¾, ventral profile little more convex than dorsal; head 3⅘. Snout equals or little shorter than eye, which 3¼ in head; maxillary reaches nearly ½ in eye; lower jaw strongly projecting; ridges on head run parallel posteriorly, greatest interspace ⅓ of eye. Lower gill rakers 20.

Scales 43 in medial lateral series; 14 or 15 transversely. Ventral scutes 19+8.

D. (15)16, origin little nearer snout tip than caudal base; A. 40(42), origin below posterior part of dorsal, base length 3 in body; ventral shorter than eye, inserted midway between anal origin and pectoral base.

Caudal dark edged. Length, 160 mm. (Norman.)

India, East Indies.

ILISHA MOTIUS (Buchanan-Hamilton)

Clupanodon motius BUCHANAN-HAMILTON, Fishes of Ganges, pp. 251, 383, 1822 (type locality: Brahmaputra River).

Clupea motius GRAY, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 109, figs. 3–4, 1832–34.

Pellona motius VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 323, 1847 (Ganges mouth).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 72, 1853 (reference).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 456, 1868 (copied).—DAY, Fishes of India, pt. 4, p. 643, pl. 165, fig. 3, 1878 (Assam, Bengal, Orissa); Fauna British India, Fishes, vol. 1, p. 381, 1889.

Ilisha motius NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 5, 1923 (Assam; Bengal).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1934 (reference).

Platygaster parva SWAINSON, Nat. Hist. Animals, vol. 2, p. 294, 1839 (on Gray).

Depth 3¾ to 4, ventral profile more convex than dorsal; head 4¼ to 4½. Snout shorter than eye, which 2⅔ in head; maxillary reaches ½ in eye; lower jaw a little projecting; ridges on head run parallel posteriorly. Lower gill rakers 22 to 24.

Scales 45 ? in medial lateral series; 12 or 13 ? transversely. Ventral scutes 16 or 17+7 or 8.

D. 16 or 17, origin much nearer snout tip than caudal base; A. 40 to 43, origin just behind dorsal, base length about 3 in body length; ventrals equal eye, inserted little nearer pectoral base than anal origin.

A silvery lateral band. Length, 55 mm. (Norman.)

Bengal, Assam. According to Day it does not exceed much over 100 mm.

Subgenus ILISHA Richardson

Scales more than 46 in medial lateral series. Preventral scutes 20 to 28.

ILISHA PRISTIGASTROIDES (Bleeker)

Pellona pristigastroides Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 20, 1852 (type locality: Batavia, Java).—Günther, Cat. Fishes British Mus., vol. 7, p. 459, 1868 (type).—Düncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 186, 1904 (Kuala Lumpur).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 89, 1913 (type).—Hardenberg, Treubia, vol. 13, livr. 1, p. 112, 1931 (Bagan Si Api Api).—Suvatti, Index Fish. Siam, p. 11, 1937 (Gulf of Siam).

Ilisha pristigastroides Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 121, pl. (11)269, fig. 1, 1866–72 (Java and Borneo).—Norman, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 6, 1923 (type).—Fowler, List Fish. Malaya, p. 29, 1938 (reference).

Depth 3¼, ventral profile, especially anteriorly, much more convex than dorsal; head 4¼. Snout little shorter than eye, which 3¾ in head; maxillary nearly reaches ½ in eye; lower jaw strongly projecting; ridges on head diverge posteriorly, greatest interspace 2¾ in eye. Lower gill rakers 17.

Scales 50 in medial lateral series; 14 or 15 transversely. Ventral scutes 27+12, prominent.

D. 17, origin much nearer caudal base than snout end, equidistant from former and front eye edge; A. 48, origin below first dorsal ray, base length 2½ in body length; ventrals shorter than eye, inserted nearer pectoral base than anal origin. (Norman.)

Body above golden or bluish green, below yellowish silvery. Snout end dusky. Iris yellowish or rosy. Fins yellowish, caudal with hind edge dusted brown. Length, 185 mm. (Bleeker.)

Java, Borneo.

ILISHA AMBLYUROPTERA (Bleeker)

Pellona amblyuropterus Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 21, 1852 (type locality: Batavia, Java).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 90, 1913 (Bagan Api Api, Sumatra).—Chabanaud, Service Océanogr. Pêches Indo-Chine, 1ᵉ note, p. 9, 1926 (Tonkin).—Hardenberg, Treubia, vol. 15, livr. 3, p. 231, 1936 (Telok Pekadai, Borneo).—Suvatti, Index Fish. Siam, p. 10, 1937 (Siam; Gulf of Siam; Sriracha).

Pellona amblyuroptera Günther, Cat. Fishes British Mus., vol. 7, p. 459, 1868 (East India).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 618, 1926 (Sarawak).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 121, 1929 (Cochinchina).

Ilisha amblyuropterus Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, pl. (4) 262, fig. 4, 1866–72 (Java, Sumatra, Singapore, Borneo).—Norman, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 7, 1923 (Malay Archipelago).—Fowler, List Fish. Malaya, p. 28, 1938 (reference).

Depth 3⅓, ventral profile more convex than dorsal; head 4. Snout little shorter than eye, which 4¼ in head; maxillary reaches ½ in eye or beyond; lower jaw strongly projecting; ridges on head diverge posteriorly, greatest interspace ⅓ of eye. Lower gill rakers 16.

Scales 52 or 53 in median lateral series; 15 or 16 transversely. Ventral scutes 27+12.

D. 17, origin much nearer caudal base than snout tip, equidistant from former and eye center; A. 47 (47 to 53), origin below front third of dorsal, base length 2⅔ in body length; ventrals shorter than eye; inserted little nearer pectoral base than anal origin. (Norman.)

Above greenish, below yellowish silvery. Snout and lower jaw dusky to blackish terminally. Iris yellowish. Fins yellow, dorsal and caudal minutely dotted gray. Length, 381 mm. (Bleeker.)

Singapore, East Indies.

ILISHA SLADENI (Day)

Pellona sladeni Day, Proc. Zool. Soc. London, 1869, p. 623 (type locality: Irrawaddi at Mandalay, Burma); Fishes of India, pt. 4, p. 645, pl. 164, fig. 1, 1878 (Irrawaddi); Fauna British India, Fishes, vol. 1, p. 383, 1889.

Ilisha sladeni Norman, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 6, 1923 (Irrawaddi and Sittang Rivers, Burma).

Depth 4 to 4⅓, greatest convexity of ventral profile before pectorals; head 4 to 4¼. Snout little shorter than eye, which 4¼ to 4⅔ in head; maxillary reaches ⅓ in eye; lower jaw very oblique, strongly projecting; ridges on head diverge little posteriorly, greatest interspace 3 to 3½ in eye. Lower gill rakers 20 to 22.

Scales 46 to 49 in medial lateral series; 10 or 11 transversely. Ventral scutes 24+10 or 11.

D. 14 or 15, origin much nearer caudal base than snout end, equidistant from former and hind opercle edge; A. 42 to 45, origin below front half of dorsal, base length 3¼ to 3⅗ in body length; ventrals equal or little longer than eye, inserted much nearer pectoral base than anal origin.

Caudal with dark edge posteriorly. Length, 340 mm. (Norman.)

Burma.

ILISHA NOVACULA (Valenciennes)

Pellona novacula Valenciennes, Hist. Nat. Poiss., vol. 20, p. 319, 1847 (type locality: Rangoon).—Günther, Cat. Fishes British Mus., vol. 7, p. 458, 1868 (Batavia).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 92, 1913 (Bleeker's specimen).

Ilisha novacula Bleeker, Nederland. Tijdschr. Dierk., vol. 3, p. 302, 1866 (Batavia, in sea); Atlas Ichth. Ind. Néerland., vol. 6, p. 120, pl. (11)269, fig. 4, 1866–72 (Java); Nederland. Tijdschr. Dierk., vol. 4, p. 118, 1874 (Chinese drawing).—Norman, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 8, 1923 (Java).

Depth 3½, greatest convexity of ventral profile below pectoral base; head 4. Snout little shorter than eye, which 3¾ in head; maxillary reaches almost to hind eye edge; lower jaw strongly projecting; ridges on head diverge little posteriorly, greatest interspace ⅓ of eye. Lower gill rakers 20.

Scales 45 in medial lateral series; 14 or 15 transversely. Ventral scutes 24+10, prominent.

D. 17, origin nearer caudal base than snout end, equidistant from former and front eye edge; A. 42, origin below hind half of dorsal, base length 3⅕ in body length; ventrals shorter than eye, inserted little nearer pectoral base than anal origin. (Norman.)

Above bluish green, below yellowish silvery. End of snout dusky. Iris yellow. Fins yellowish. Length, 230 mm. (Bleeker.)

Burma, Java, China.

ILISHA FILIGERA (Valenciennes)

Pellona filigera Valenciennes, Hist. Nat. Poiss., vol. 20, p. 322, 1847 (type locality: Coromandel; Bombay).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 72, 1853 (reference).—Günther, Cat. Fish. Brit. Mus., vol. 7, p. 454, 1868 (copied).—Day, Fishes of India, pt. 4, p. 643, pl. 165, fig. 5, 1878 (Bombay); Fauna British India, Fishes, vol. 1, p. 380, 1889.—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 174, 1929 (Thudaumot).—Chevey, Inst. Océanogr. Indochine, 19ᵉ note, p. 9, 1932 (Indo-China).

Ilisha filigera Norman, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 10, 1923 (India).

Depth 3, ventral profile more convex than dorsal; head 3¾. Snout 3¾ in head from upper jaw tip; eye 2⅗, greater than snout; maxillary reaches ½ in eye, width 2 in eye, length 1⅘ in head from snout tip; teeth in jaws, on palate and tongue; interorbital 3 in eye, moderately high.

Scales 50 in medial lateral series; 15 or 16 transversely. Ventral scutes 22 or 23+10 to 12.

D. III or IV, 15 or 16, first branched ray 1¾ in total head length; A. III, 43 to 47, first branched ray 4½, fin base 2½ in combined head and body to caudal base; caudal 3 in rest of body, well forked, slender lobes pointed; least depth of caudal peduncle 2⅘ in head; pectoral 1⅖; ventral 6.

Coppery tinge along back, sides silvery, with mother-of-pearl reflections. Dorsal and pectoral black tipped. Length, 305 mm. (Day.)

India. Very close to *Ilisha xanthoptera* (Bleeker) and according to Norman differs in but 18 or 19 lower gill rakers and ventral scutes 22+10 or 11.

ILISHA XANTHOPTERA (Bleeker)

Pellona xanthopterus Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 2, p. (417) 439, 1851 (type locality: Sambas, Borneo).

Pellona xanthoptera Günther, Cat. Fishes British Mus., vol. 7, p. 457, 1868 (type; East Indies).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 94, 1913 (Krawang, Java).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 9, 1932 (Indo-China).—Hardenberg, Treubia, vol. 15, livr. 3, p. 231, 1936 (Telok Pekadai, Borneo).

Ilisha xanthopterus BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (7)265, fig. 3, 1866–72 (Borneo).

Ilisha xanthoptera NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 9, 1923 (type; Malay Archipelago).

Depth 3 to 3⅓, ventral profile more convex than dorsal; head 3¾ to 4. Snout shorter than eye, which 3⅙ to 3⅔ in head; maxillary reaches below front part or ½ in eye; lower jaw strongly projecting; ridges on head run parallel posteriorly, greatest interspace 3⅓ to 4 in eye. Lower gill rakers 21 to 23.

Scales 50 to 52 in medial lateral series; 15 or 16 transversely. Ventral scutes 24 to 27+10 to 13.

D. 17 or 18, origin equidistant from snout end and caudal base, or little nearer former; A. 46 to 48, origin below hind part of dorsal or below its last rays, base length 2⅗ to 2⅞ in body length; vertical distance from upper end of pectoral base to thorax equal to or greater than postocular part of head; ventral shorter than eye, inserted well before dorsal, little nearer pectoral base than anal origin. (Norman.)

Body above bluish green, below yellowish silvery. Snout and mandible dusky terminally. Iris yellowish. Fins yellow, dorsal and caudal with minute dusky dots. Length, 362 mm. (Bleeker.)

East Indies.

ILISHA MELASTOMA (Cuvier)

Clupea melastoma CUVIER, Règne Animal, ed. 2, vol. 2, p. 319, 1829 [on *Jangarloo* Russell, Fishes of Coromandel, vol. 2, p. 73, pl. 191, 1803 (type locality: Vizagapatam)].

Platygaster megalopterus SWAINSON, Nat. Hist. Animals, vol. 2, p. 294, 1839 (on *Jangarloo* Russell).

Pellona megaloptera JERDAN, Madras Journ. Lit. Sci., vol. 17, p. 145, 1851.—DAY, Fishes of India, pt. 4, p. 645, pl. 165, fig. 2, 1878; Fauna British India, Fishes, vol. 1, p. 382, 1889.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 121, 1929 (Cochinchina).

Ilisha megalopterus BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 119, pl. (6) 264, fig. 6, 1866–72 (Java, Madura, Singapore, Bintang, Banka, Borneo, Amboina).

Ilisha megaloptera NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 10, 1923 (type of *Pellona russelli*, India, Malay Peninsula and Archipelago).—FOWLER, List Fish. Malaya, p. 29, 1938 (reference).

Pellona dussumieri VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 316, pl. 596, 1847 (type locality: Malabar; Coromandel; Bombay).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 457, 1868 (copied).—DAY, Fishes of India, pt. 4, p. 645, 1878 (probably=*Pellona megaloptera*).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 92, 1913 (Batavia, Bagan Api Api, Kota baru).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1ᵉ note, p. 9, 1926 (Cochinchina).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 112, 1931 (Bagan Si Api Api); vol. 15, livr. 3, p. 231, 1936 (Kapuas R., Borneo).—SUVATTI, Index Fish. Siam, p. 10, 1937 (Gulf of Siam; Bangkok; Maenam Canthaburi).

Pellona micropus VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 320, 1847 (type locality: Coromandel coast, Bengal).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 454, 1868 (copied).

Pellona leschenaultii (not Valenciennes) Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal and Tanjong); (Mid. Oost Java), vol. 23, p. 11, 1850.

Pellona russellii Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 23, 1852 (type locality: Batavia, Samarang, Surabaja, Pasuruan).

Pellona motius (part) Günther, Cat. Fish. Brit. Mus., vol. 7, p. 456, 1868 (Bengal).

Depth 3⅖; head 3½, width 3⅛. Snout 3⅕ in head from snout tip; eye 3⅗, equals snout, much greater than interorbital; maxillary reaches ¼ in eye, expansion 1⅖ in eye, length 1⅞ in head from snout tip; teeth few, small, short, low, conspicuous in front of each jaw; patch of villiform teeth on each palatine and pterygoid, none on vomer or tongue; interorbital 7⅓, convexly elevated; cheek venulose. Gill rakers 10+20, lanceolate, 1⅖ in eye, twice gill filaments.

Scales caducous, 50 (pockets) in median lateral series to caudal base; 20 transversely, 21 predorsal. Abdominal serrae 24+12. Scales with 2 incomplete vertical striae; circuli very fine, parallel and transverse, none apical.

D. iii, 15 (fin rays broken), depressed fin length 1⅞ in total head length; A. iii, 43, i, second branched ray 3¾; caudal (damaged) apparently less than head, well forked and lobes sharply pointed; least depth of caudal peduncle 3⅓; pectoral 1½; ventral 5⅕.

Back drab-brown, sides and under surface silvery white. Upper surface of snout and mandible, also occiput, brownish. Fins all pale brownish, dorsal and caudal little darker.

India, Malay Peninsula, Singapore, East Indies. According to Bleeker reaches 310 mm.

Compared with Bleeker's figure of *Ilisha megalopterus* my specimen shows the pectoral with its broken end reaching much nearer the ventral.

5107. Sandakan Bay, Borneo. March 3, 1908. Length, 260 mm.

ILISHA MACROGASTER Bleeker

Ilisha macrogaster Bleeker, Nederland. Tijdschr. Dierk., vol. 3, p. 300, 1866 (type locality: Sambas, western Borneo); Atlas Ichth. Ind. Néerland., vol. 6, p. 121, pl. (13) 271, fig. 4, 1866–72 (Borneo).—Norman, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 9, 1923 (types).

Pellona macrogaster Günther, Cat. Fishes British Mus., vol. 7, p. 458, 1868 (type).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 93, 1913 (copied).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 13, 1937 (Ketam I., Selangor).

Depth 3, ventral profile, especially anteriorly, much more convex than dorsal; head 4. Snout shorter than eye, which 2½ to 2¾ in head; maxillary reaches below front part of eye; lower jaw moderately projecting; ridges on head run parallel posteriorly, greatest interspace 3½ to 3¾ in eye. Lower gill rakers 21 to 24.

Scales 50 in medial lateral series; 15 (?) transversely. Ventral scutes 26+10, prominent.

D. 16 or 17, origin very little nearer snout end than caudal base; A. 47 or 48, origin below hind half of dorsal, base length 2½ to 2¾ in body length; ventrals shorter than eye, inserted nearer pectoral base than anal origin. (Norman.)

Body above bluish or golden green, below silvery or yellowish silvery. Snout and mandible dusky terminally. Iris and fins yellowish. Length, 150 mm. (Bleeker.)

Borneo, in rivers.

ILISHA ELONGATA (Bennett)

Alosa elongata BENNETT, Life of Raffles, p. 691, 1830 (type locality: Sumatra).

Pellona elongata GÜNTHER, Cat. Fishes, British Mus., vol. 7, p. 456, 1868 (Sumatra, China, Amoy, Japan; types of *Ilisha abnormis* and *Pellona schlegelii*); Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 158, 1874 (Chefoo).—DAY, Fishes of India, pt. 4, p. 643, pl. 164, fig. 3, pl. 165, fig. 1, 1878 (India, Sind, Bombay).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).—DAY, Fauna British India, Fishes, vol. 1, p. 380, fig. 117, 1889.—ELERA, Cat. Fauna Filip., vol. 1, p. 583, 1895 (Manila, Cavite, Santa Cruz).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 90, fig. 30, 1913 (Batavia).—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 481, 1924 (Singgora).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).—TIRANT, Service Oceanogr. Pêches Indo-Chine, 6^e, note, pp. 120, 174, 1929 (Thaudeumot).—CHEVEY, Inst. Océanogr. Indochine, 19^e note, p. 9, 1932 (Cochin China).—SUVATTI, Index Fish. Siam, p. 11, 1937 (reference).

Ilisha elongata BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 119, pl. (119) 259, fig. 3, 1866–72 (Java, Madura, Sumatra, Pinang, Singapore, Banka, Borneo.)—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 53, 1901 (reference).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 328, 1902 (Formosa).—JORDAN and SEALE, Proc. Davenport Acad. Sci., vol. 10, p. 3, 1905 (Hong Kong).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 635, 1906 (Hong Kong, Nagasaki, Wakanoura).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 166, 1909 (copied Formosa record).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 591, 1912 (Batavia).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus., Vertebrata, p. 183, 1920 (Yanagawa).—NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 7, 1923 (type; types of *Ilisha abnormis* and *Pellona schlegelii;* India, Malay Archipelago, China, Japan).—MORI, Journ. Pan. Pacific Res. Inst., vol. 3, p. 3, 1928 (Jinsen, Korea).—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 103, 1928 (Bombay).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 16, fig. 12, 1929 (Amoy).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 599, 1930 (Hong Kong).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 19, 1931 (Fusan).—FOWLER, List Fish. Malaya, p. 28, 1938 (reference).

Clupea affinis GRAY, Illustr. Indian Zool. Hardwicke, vol. 1, pl. 96, fig. 2, 1835 (type locality: India).

Platygaster affinis SWAINSON, Nat. Hist. Animals, vol. 2, p. 294, 1839 (on Gray).

Pellona affinis CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1273, 1849 (Pinang, Malay Peninsula, Singapore).

Clupea melastoma (not Schnieder) Bleeker, Nat. Geneesk. Arch. Nederl.-Indië vol. 2, p. 509, 1845 (Batavia).—Schlegel, *in* Siebold's Fauna Japonica, Poiss., pts. 10–15, p. 237, pl. 108, fig. 1, 1846 (Simabara Bay and Nagasaki).

Ilisha abnormis (Gray) Richardson, Ichth. China Japan, p. 306, 1846 (type locality: Chinese Sea).

Pellona grayana Valenciennes, Hist. Nat. Poiss., vol. 20, p. 315, 1847 (on Gray).—Kner, Reise *Novara*, Fische, 1865, p. 328 (Java; Hong Kong).—Bleeker, Nederland. Tijdschr. Dierk., vol. 2, p. 56, 1865 (Amoy).

Pellona vimbella Valenciennes, Hist. Nat. Poiss., vol. 20, p. 317, 1847 (type locality: Macao).

Pellona schlegelii Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 18, 1853 (type locality: Nagasaki); Nat. Tijds. Nederland. Indië, vol. 6, p. 418, 1854 (Nagasaki); Verh. Batav. Genootsch. (Japan), vol. 26, pp. 6, 118, 1857 (Nagasaki); Act. Soc. Sci. Ind. Néerland., No. 3, vol. 3, p. 6, 1858 (Japan).

Ilisha schlegeli Bleeker, Versl. Akad. Wet. Amsterdam, ser. 2, vol. 4, p. 252, 1870 (China).

Pristigaster chinensis Basilewski, Nouv. Mém. Soc. Nat. Moscou, vol. 10, p. 243, 1855 (type locality: Gulf of Tschiliensis, China).—Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 148, 1874 (copied).

Zunasia chinensis Jordan and Metz, Mem. Carnegie Mus., vol. 6, No. 1, p. 7, pl. 1, fig. 1, 1913 (Chinnampo, Korea).—Mori, Journ. Pan-Pacific Res. Inst., vol. 3, p. 3, 1928 (Genzan, Korea).

Pristigaster (*Pristigaster*) *sinensis* Sauvage, Bull. Soc. Philom., Paris, ser. 7, vol. 5, p. 107, 1881 (type locality: Swatow).

Pristigaster sinensis Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 64 (copied).

Depth 3 to 3⅕; head 3 to 3¾, width 2⅓ to 2⅔. Snout 3¾ to 3⅘ in head from snout tip; eye 2⅞ to 3, greater than snout, nearly 3 times interorbital, front adipose lid covering first third of iris; maxillary reaches ⅖ to ⅗ in eye, expansion 1⅖ to 1⅔ in eye, length 1⅘ to 2 in head; teeth villiform, in narrow bands in jaws and on each palatine, broad band on tongue, none on vomer; mandible protrudes about ⅗ eye diameter before snout; interorbital 6¾ to 7½ in head, little convex. Gill rakers 8+20, lanceolate, little longer than gill filaments or ½ of eye.

Scales 44 or 45 in median lateral series to caudal base and 4 more on latter; 7 transversely, 17 predorsal. Abdominal serrae 19 to 23+8 to 11. Scales with 1 or 2 transverse striae, usually incomplete; circuli as very fine vertical parallel striae, none apical.

D. iii, 9, i (damaged), first branched ray 2 in total head length, inserted midway between snout tip and caudal base; A. iii, 35 (damaged), inserted below last dorsal rays, length 3 in combined head and body to caudal base, first branched ray 4 in head; caudal slightly shorter than total head length, well forked; least depth of caudal peduncle 2⅔ to 3⅕; pectoral 1⅖; ventral 5.

Drab gray, evidently largely silvery white. Iris grayish. Fins silvery.

India, Singapore, Pinang, East Indies, Philippines, Cochinchina, Formosa, China, Japan, Korea.

U.S.N.M. No. 37765. Korea. Bernadon. Length, 137 mm., caudal damaged.
U.S.N.M. No. 47988. Cochin China. Lyons Museum. Length, 240 mm., caudal tips broken.
U.S.N.M. No. 57623. Japan. P. L. Jouy. Length, 270–300 mm. 2 examples.
U.S.N.M. No. 72513. Batavia, Java. Bryant and Palmer. Length, 90 mm. 1 example. A.S.N.P. Bombay, India. Prof. F. Hallberg. Length, 305 mm.
A.N.S.P. No. 52869. Honk Kong. April 1929. Henry W. Fowler. Length 285 mm.

Genus OPISTHOPTERUS Gill

Opisthopterus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 38. (Type, *Pristigaster tartoor* Valenciennes, orthotypic.)

Anal rays 56 to 65. Differs from *Ilisha* in the absence of ventral fins and the dorsal origin behind that of the anal.

Besides the 2 Indo-Pacific species described below, 3 others from the Pacific coasts of tropical America.

ANALYSIS OF SPECIES

*a*¹. Depth 3⅙ to 3¾; hind supramaxillary not nearly reaching to hind end of maxillary -- tardoore
*a*². Depth 4⅙; hind supramaxillary nearly reaching hind end of maxillary. valenciennesi

OPISTHOPTERUS TARDOORE (Cuvier)

Pristigaster tardoore CUVIER, Règne animal, ed. 2, vol. 2, p. 321, 1829 (on *Tartoore* Russell, Fishes of Coromandel, vol. 2, p. 74, pl. 193, lower fig., 1803, type locality: Vizagapatam).

Pristigaster tartoor VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 328, 1847 (Coromandel, Malabar).—BLEEKER, Verh. Batav. Genootsch. (Haring.), vol 24, p. 25, 1852 (Batavia).—DAY, Fishes of Malabar, 1865, p. 232.—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 460, 1868 (East Indies).

Opisthopterus tartoor BLEEKER, Nederland. Tijdschr. Dierk., vol. 3, p. 296, 1866 (Batavia; Singapore); Atlas Ichth. Ind. Néerland., vol. 6, p. 123, 1866–72 (Java; Singapore).—DAY, Fishes of India, pt. 4, p. 646, pl. 163, fig. 5, 1878 (Gwadur, Sind, India); Fauna British India, Fishes, vol. 1, p. 384, 1889.—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 591, 1912 (Pelaboen Ratoe).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 95, fig. 31, 1913 (Batavia, Bagan Api Api).—FOWLER, Journ. Bombay Soc. Nat. Hist., vol. 30, p. 38, 1924 (Calicut).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 617, 1926 (Sarawak).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, No. 2, p. 355, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 121, 1929 (Cochin China).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 599, 1930 (Hong Kong).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 112, 1931 (Bagan Si Api Api).—CHEVEY, Inst. Océanogr. Indochine, 19ᵉ note, p. 10, 1932 (Indo China).—HARDENBERG, Treubia, vol. 15, livr. 3, p. 231, 1936 (Telok Pekadai, Borneo).

Pristogaster indicus SWAINSON, Nat. Hist. Animals, vol. 2, p. 294, 1839 [on *Tartoore* Russell, Fishes of Coromandel, vol. 2, p. 74, pl. 193, 1803, type locality: Vizagapatam].—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.

Opisthopterus indicus NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 12, 1923 (India, Malay Archipelago, type of *Opisthopterus macrognathus*).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 94, 1935 (Bangkok);

vol. 89, p. 131, fig. 2, 1937 (Bangkok; Paknam); List Fish. Malaya, p. 30, 1938 (reference).

Opisthopterus macrognathus BLEEKER, Nederland. Tijdschr. Dierk., vol. 3, p. 299, 1866 (on *Pristigaster tartoor* Bleeker 1852); Atlas Ichth. Ind. Néerland., vol. 6, p. 124, pl. (10) 268, fig. 4, 1866–72 (Java, Sumatra, Singapore, Borneo).—FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang, Sumatra); Proc. Acad. Nat. Sci. Philadelphia, p. 210, 1911 (Padang examples).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 96, fig. 32 (maxillary), 1913 (Batavia; Tjilatjap).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 617, 1926 (Santubong).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 71, p. 1, 1927 (Benkoelen, Sumatra).—SUVATTI, Index Fish. Siam, p. 11, 1937 (Gulf of Siam; Maenam Canthaburi).

Pristigaster macrognathus GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 461, 1868 (type: Sarawak).

Depth 3⅙ to 3¾; head 4 to 4⅖, width 2¾ to 3. Snout 4 to 4⅛ in head from snout tip; eye 2¾ to 3, greater than snout or interorbital; maxillary reaches ⅓ to ⅔ in eye, expansion 1½ to 2 in eye, length 2⅓ to 2⅔ in head from upper jaw without median notch; teeth very minute, single row in jaws and along entire lower maxillary edge; interorbital 2 to 2½ in eye, convexly elevated; opercle smooth. Gill rakers 9 or 10+22 to 25, finely lanceolate, little longer than gill filaments or 1⅘ to 2 in eye.

Scales 40 ? to 46 in median lateral series to caudal base and 3 or 4 more on latter; 16 ? transversely, 36 ? predorsal. Abdominal scutes 27 to 34. Scales very caducous, all fallen from trunk, rather small and narrowly imbricated.

D. III, 9 to 12 ? first branched ray 1⅔ to 2 in total head; A. III, 50 to 63, I, first branched ray 1⅔ to 2 in eye; least depth of caudal peduncle 1 to 2¾ in total head; caudal 1⅛ to 2, small, forked; pectoral 1 to 1⅛.

Pale uniform brown. Dusky brown median streak down back. Top of head and ends of jaws sprinkled with dusky dots. Iris and side of head silvery white. Fins pale. Pectoral and caudal with few dull dusky dots.

India, China, East Indies.

U.S.N.M. No. 72514. Pelaboen Ratoe, Wynkop's Bay, Java. Bryant and Palmer. October 1909. Length, 140 mm.

3 examples A.N.S.P. Calicut, India. James Hornell. Length, 69–74 mm.

A.N.S.P. No. 52868. Hong Kong. Henry W. Fowler. Length, 208 mm.

1 example A.N.S.P. Padang, Sumatra. A. C. Harrison and H. M. Miller. When fresh in arrack gray-brown on back, sides and rest of body silvered grayish white, latter more intense below. Iris silvery white. Fins all pale or whitish.

OPISTHOPTERUS VALENCIENNESI Bleeker

Opisthopterus valenciennesi BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 124, 1866–72 (type locality: East Indies).—NORMAN, Ann Mag. Nat. Hist., ser. 9, vol. 11, p. 11, 1923 (Bleeker's example).—FOWLER, List Fish. Malaya, p. 30, 1938 (reference).

Pristigaster tartoor (part) BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 25, 1852 (Batavia).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 460, 1868.

Opisthopterus tartoor BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 123, pl. (5)263, fig. 5, 1866-72 (Java).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 95, fig. 31, 1913 (Batavia; Bagan Api Api).

Depth 4⅙, ventral profile more convex than dorsal, especially convex from chin to anal; head 5¼, upper profile concave. Snout shorter than eye, which 3⅕ in head; maxillary reaches ¼ in eye, posterior supramaxillary extends almost to end of maxillary; lower jaw very oblique, strongly projecting; ridges on head diverge posteriorly, greatest interspace 3¾ in eye. Lower gill rakers 24 or 25.

Scales 52 in medial lateral series. Ventral scutes 31.

D. 17, origin midway between upper end of pectoral base and caudal base; A. 64, origin midway between mandible tip and caudal base, base length 2⅓ in body length; vertical distance from upper end of pectoral base to thorax edge 2 in head length. (Norman.)

Silvery, except on back. Dark patch behind upper angle of opercle. Fins hyaline. Caudal with dusky margin. Length over 200 mm. (Weber and Beaufort.)

East Indies.

Genus RACONDA Gray

Raconda GRAY, Zool. Misc., vol. 1, p. 9, 1931. (Type, *Raconda russeliana* Gray, monotypic.)

Apterygia GRAY, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 92, fig. 11, 1832–34. (Type, *Apterygia ramcarate* Gray, monotypic.)

Body oblong, well compressed, belly very convex and abdomen feebly serrated. Maxillary tapering behind and reaches gill opening with age. Lower jaw projects. Teeth minute, single series in jaws, in velvety patches on palatines, pterygoids, and tongue, none on vomer. Pseudobranchiae well developed. Scales moderate, thin, very deciduous, without transverse grooves. No dorsal or ventral fins. Anal very long, rays 83 to 92. Caudal deeply forked, small. Pectoral moderate, uppermost ray enlarged.

One species.

RACONDA RUSSELIANA Gray

Raconda russeliana GRAY, Zool. Miscellany, vol. 1, p. 9, 1831 (type locality: Sangar Roads, India).—FOWLER, List Fish. Malaya, p. 30 (247), 1938 (reference).

Raconda russelliana CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1274, 1849 (Pinang, Malay Peninsula, Singapore).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 124, 1866–72 (Pinang; Singapore).—DAY, Fishes of India, pt. 4, p. 646, pl. 163, fig. 4, 1878 (Bengal Bay, Sunderbunds); Fauna British India, Fishes, vol. 1, p. 384, fig. 119, 1889.—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 97, fig. 33, 1913 (Bagan Api Api).—NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 16, 1923 (Bengal Bay, Malay Peninsula and

Archipelago; type; type of *Apterygia ramcarate*).—HARDENBERG, Treubia, vol. 13, Livr. 1, p. 112, 1931 (Bagan Si Api Api).—CHEVY, Inst. Océanogr. Indochine, 19^e^ note, p. 10, 1932 (Indo China).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 12, 1937 (Sumatra coast 100 miles west of Singapore).

Raconda ruseliana TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e^ note, p. 122, 1929 (Cochinchina).

Pristigaster russellianus GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 462, 1868 (Bengal; types; type of *Apterygia ramcarate;* Pinang).

Apterygia ramcarate GRAY, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 92, fig. 1, 1832–34 (type locality: Sangor Rocks).

Apterygia hamiltoni VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 333, 1847 (on Gray).

Depth 3¾ to 4, ventral profile more convex than dorsal, especially convex forward; head 5⅔ to 6, dorsal profile concave. Snout shorter than eye, which 3 to 3⅓ in head; maxillary reaches below anterior part of eye, with age ½ in eye; lower jaw very oblique, projecting; ridges on head diverge posteriorly. Lower gill rakers 22 to 26.

Scales 60 to 64 in medial lateral series; 12 transversely. Ventral scutes 33 to 37, weak.

A. 83 to 92, origin much nearer mandible tip than caudal base, base length 1¾ in body length; pectorals equal or little longer than head. (Norman.)

Narrow dark or blackish band along back, sides yellowish, below silvery. Deep brown or black spot on shoulder, sometimes continued on opercle. Length about 200 mm (Weber and Beaufort.)

India, Malay Peninsula, Singapore, Sumatra.

Family ENGRAULIDAE

Body oblong or elongate, more or less compressed. Belly sharp or rounded, with more or less numerous, keeled abdominal scutes. Snout prominent, usually overlaps mouth. Eye moderate or enlarged, advanced, without adipose eyelid. Mouth very large, border formed of very small premaxillaries, which separated at symphysis, and long narrow maxillary, which may be greatly extended and with two supplemental bones. Teeth uniserial, usually small, sometimes obsolete, rarely canines. Small teeth on vomer, palatines, pterygoids and tongue. Gill membranes more or less united, free from isthmus. Gill rakers long, slender. Pseudobranchiae present. Scales thin, modified or large, cycloid, mostly deciduous. No lateral line. Fins variable. Dorsal usually short and median, above or before usually long anal. No adipose dorsal. Caudal forked.

Small gregarious fishes, mostly translucent, on all warm sandy shores.

Engraulis compressus Elera, Cat. Fauna Filip., vol. 1, p. 580, 1895 (Luzon, Manila), I am at a loss to locate, as it should in no way be confused with the Californian *Anchoviella compressa* (Girard).

ANALYSIS OF GENERA

a^1. ENGRAULINAE. Body moderately long; anal free from strongly forked caudal; upper pectoral rays not extended as slender filaments.
  b^1. Silvery coloration absent only on back.
    c^1. Body more or less compressed; abdominal scutes at least between pectorals and anal.
      d^1. Upper pectoral ray not produced; A. 30 to 50, length 3 to 5 in total length without caudal.
        e^1. Teeth in jaws partly caninelike; scales 42 to 50.
          f^1. Dorsal origin behind anal origin__________________ Lycothrissa
          f^2. Dorsal origin well before anal origin_____________ Xenengraulis
        e^2. Teeth uniform, minute; scales 35 to 45; dorsal origin before anal origin____ Thrissocles
      d^2. Upper pectoral ray produced; A. 50 to 75, fin 2 to 2½ in total length without caudal____ Setipinna
    c^2. Body more or less robust, partly cylindrical; dentition feeble, without canines; no abdominal scutes; fins without produced rays; A. 17 to 23____ Engraulis
  b^2. Silvery coloration limited chiefly to a conspicuous lateral band; abdominal scutes largely or only between pectorals and ventrals______ Anchoviella
a^2. COILIINAE. Body greatly elongate, tail long and tapering; caudal little or not forked, lower portion continuous with long anal; upper pectoral rays produced as slender filaments___________________________________ Coilia

Genus LYCOTHRISSA Günther

Lycothrissa GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 399, 1868. (Type, *Engraulis crocodilus* Bleeker, monotypic.)

Body elongate, compressed. Head small. Snout short. Eye small. Mouth oblique. Maxillary narrow, extending to mandibular joint, supplementary bone only partly ossified. Jaws with caninelike teeth, especially few in mandible. Small teeth on vomer, palatines, pterygoids, and tongue. Scales moderate, thin, deciduous, with irregular curved transverse lines. Not very conspicuous abdominal scutes from below pectorals to vent. Dorsal origin behind anal origin. Anal very long. Upper pectoral ray not produced. Ventral small. One species.

LYCOTHRISSA CROCODILUS (Bleeker)

Engraulis crocodilus BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 1, p. 15, 1851 (type locality: Banjermassing, in rivers); Verh. Batav. Genootsch. (Harding.), vol. 24, p. 35, 1852 (Borneo).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 399, 1868 (type).—SAUVAGE, Bull. Soc. Philom. Paris. ser. 7, vol. 7, p. 151, 1883 (Maenam).—TIRANT, Service Océanogr. Peches Indo-Chine, 6ᵉ note, pp. 114, 174, 1929 (Phuoc Hai, Thudaumot).

Engraulis (*Lycothrissa*) *crocodilus* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (10)268, fig. 1, 1866–72.—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 404, 1876 (Bangkok; Pontianak and Sinkawang, Borneo).

Lycothrissa crocodilus BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 125, 1866–72 (Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 31, fig. 16, 1913 (Djambi).—CHABANAUD, Service Oceanogr. Peches Indo-Chine, 1ᵉ note, p. 8, 1926 (Cambodia).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 96, 1935 (Bangkok).—Hardenberg, Treubia, vol. 15, livr. 3, p. 228, 1936 (middle course Kapuas R., Borneo).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 96, 1935 (Bangkok); vol. 89, p. 132, 1937 Paknam).—Suvatti, Index Fish. Siam, p. 17, 1937 (Maenam Can).—Fowler, List Fish. Malaya, p. 33, 1938 (reference).

Depth 5; head 4⅖, width 3. Snout 4⅔ in head; eye greater than snout or interorbital; maxillary not quite reaching hind preopercle ridge or mandibular joint, expansion 1⅞ in eye, length 1⅕ in head; along each ramus of upper jaw 22 canine teeth, 11 along each ramus of mandible; interorbital 7⅗, convex. Gill rakers 6+10, lanceolate, 1½ in eye; gill filaments equal gill rakers.

Scales (pockets) 48 in median lateral series to caudal base and 4 more on latter; 12 transversely, 37 predorsal. Scales with 9 or 10 short marginal basal striae and 5 or 6 transversely apically; circuli very fine, transverse, close set, not apical on scale.

D. iii, 10, with small procumbent spine before fin origin, first branched ray 2 in head; A ii, 42, inserted before dorsal origin, first branched ray 2⅗; caudal 1, well forked, lobes pointed; least depth of caudal peduncle 2⅔; pectoral 1⅓; ventral 3¾.

Back gray or drab brown. Sides and lower surfaces silvery gray, evidently silvery white in life. Iris whitish. Fins all brownish. Dorsal and caudal with grayish shades.

Siam, East Indies, Cochin China, in brackish and fresh water.

U.S.N.M. No. 47989. Cochinchina. Lyons Museum. Length, 207 mm.

Genus XENENGRAULIS Jordan and Seale

Xenengraulis Jordan and Seale, Copeia, No. 141, p. 29, 1925. (Type, *Xenengraulis spinidens* Jordan and Seale, orthotypic.)

Body compressed. Head rather small. Snout little protruded. Mouth large. Maxillary reaches gill opening. Teeth in jaws large, caninelike, smaller in mandible. Palate toothed. Gill rakers few. Scales rather small, caducous. Enlarged scale at caudal base. Vertebrae 48. Abdominal scutes 27. Dorsal fin with spine in front. Anal long, inserted below hind part of dorsal.

One species.

XENENGRAULIS SPINIDENS Jordan and Seale

Xenengraulis spinidens Jordan and Seale, Copeia, No. 141, p. 29, 1925 (type locality: India, Siam, Calcutta, Rangoon); Bull. Mus. Comp. Zool., vol. 67, p. 369, 1926 (same materials).

Depth 3⅕; head 5. Snout deep, not projecting beyond lower jaw, 1⅖ in eye; eye 4⅗ in head; maxillary reaches beyond gill opening but not to pectoral base, length equals head; teeth 15 canines each side of lower jaw, on maxillary somewhat less than those of mandible still quite large anteriorly, graduating to small teeth on posterior end; small teeth on vomer, palatines and pterygoids; opercle smooth, except single groove near and parallel with front edge and small hidden spine on its upper anterior portion. Lower gill rakers 14, thin, curved, longest 1⅕ in eye.

Scales 42 in medial lateral series; 12 transversely. Scales with striae incomplete, very little network of lines showing. Abdominal scutes 16+11, begin before pectorals.

D. I–13, origin midway between hind eye edge and caudal base, base 1$\frac{9}{10}$ in longest ray; A. 46, inserted below last dorsal ray, base 2⅘ in standard length; caudal forked, slightly longer than head, lower lobe longer; pectoral equals head without snout, tip reaches middle of ventral; ventral rays 7, inserted far before dorsal origin.

Silvery, brownish above, no dark venules on scapular region. Length 208 mm. (Jordan and Seale.)

India, Burma, Siam.

Genus THRISSOCLES Jordan and Evermann

Thrissocles JORDAN and EVERMANN, Genera of Fishes, pt. 1, p. 98, 1917. (Type, *Clupea setirostris* Broussonet, orthotypic.)

Thrissa (not Rafinesque 1815) CUVIER, Règne animal, vol. 2, p. 176, 1817. (Type, *Clupea setirostris* Broussonet, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 98, 1917.)

Thryssa CUVIER, Règne animal, ed. 2, vol. 2, p. 323, 1829. (Type, *Clupea setirostris* Broussonet.)

Thryssus SWAINSON, Nat. Hist. Animals, vol. 1, p. 279(280), 1838. (Type, *Clupea setirostris* Broussonet.)

Trichosoma (not Rudolphi 1819) SWAINSON, Nat. Hist. Animals, vol. 2, p. 292, 1839. (Type, *Thrissa hamiltoni* Gray, monotypic.)

Scutengraulis JORDAN and SEALE, Copeia, No. 141, p. 30, 1925. (Type, *Thrissa hamiltoni* Gray, orthotypic.)

Thrissina JORDAN and SEALE, Copeia, No. 141, p. 30, 1925. (Type, *Clupea baclama* Forskål, orthotypic.)

Body oblong or elongate, compressed. Abdominal scutes well developed, extend from gill opening to vent. Snout prominent or short. Maxillary moderate, produced, sometimes reaches anal. Mouth oblique. Teeth minute, in jaws and on palate and tongue. Lower gill rakers 10 to 28. Branchiostegals 11 to 13. Vertebrae 39 to 45. Scales moderate, more or less deciduous. Dorsal origin usually before anal, with free spine in front. Anal origin below last dorsal rays, rays 16 to 50. Pectorals reach ventrals, upper ray not produced.

Indian Ocean, East Indies, China. Mostly small species feeding on plankton and living in large schools.

ANALYSIS OF SPECIES

a^1. Thrissocles. Keeled scutes extend from isthmus to vent along abdominal edge.

b^1. Maxillary not reaching beyond opercle.

c^1. Anal origin distinctly behind dorsal end; lower gill rakers 20 or more.

d^1. Lower gill rakers 20; maxillary not reaching gill opening. scratchleyi

d^2. Lower gill rakers 21 to 27; maxillary reaches gill opening.

e^1. Lower gill rakers 21 to 25; abdominal scutes 27; snout ¾ in eye, projects slightly malabarica

e^2. Lower gill rakers 27; abdominal scutes 23; snout equals eye, conspicuous kammalensis

c^2. Anal origin below or slightly behind end of dorsal; maxillary reaches gill opening; lower gill rakers 13 hamiltonii

b^2. Maxillary reaches at least to pectorals.

f^1. Anal below or little behind end of dorsal.

g^1. Maxillary reaches pectoral origin.

h^1. Lower gill rakers 13; anal more than 3 times in total length without caudal mystax

h^2. Lower gill rakers 17; anal 2⅔ in total length without caudal. purava

h^3. Lower gill rakers 21 to 24; anal 2⅔ in total length without caudal vitirostris

g^2. Maxillary reaches beyond pectorals.

i^1. Maxillary surpasses ventrals; lower gill rakers 12; abdominal scutes 28 setirostris

i^2. Maxillary reaches or nearly reaches ventral; lower gill rakers 16 to 20; abdominal scutes 22 to 24 dussumieri

f^2. Anal before end of dorsal; lower gill rakers 14 to 17; abdominal scutes 25 valenciennesi

a^2. Thrissina. Abdominal keel before ventral without scutes; lower gill rakers 20 to 22; anal behind dorsal baelama

Subgenus Thrissocles Jordan and Evermann

THRISSOCLES SCRATCHLEYI (Ramsay and Ogilby)

Engraulis scratchleyi Ramsay and Ogilby, Proc. Linn. Soc. New South Wales, ser. 2, vol. 1, p. 18, 1886 (type locality: Strickland River, New Guinea).—Weber, Nova Guinea, vol. 9, p. 517, 1913 (Lorentz River at Bivak Island, Regen Island and Alkmaar).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 34, 1913 (Southwest New Guinea in fresh water).—Regan, Trans. Zool. Soc. London, vol. 20, pt. 6, p. 276, 1914 (Mimika River, New Guinea).—Fowler, Mem. Bishop Mus., vol. 10, p. 32, 1928 (compiled).

Depth 4⅔ in total; head 5⅓. Snout pointed, overlaps mouth, 2 in eye; eye 3½ in head; maxillary not reaching gill opening, enlarged beyond mouth angle; teeth small, equal in both jaws, in long narrow band on palatines, in 2 small isolated patches on vomer; interorbital ¾ of eye.

Scales 43 in medial lateral series; 10 transversely. Scales large, deciduous. Abdominal serrae 16+11.

D. 12, begins somewhat nearer snout tip than caudal base, far behind ventral origin; A. 38, begins entirely behind dorsal, front rays much longest; caudal deeply forked; pectoral rays 13, reach ventral, upper ray not produced; ventral rays 7.

Bluish on back, silvery on sides and beneath, steel blue band separating 2 colors. Dorsal and caudal clouded at margin. Length, 141 mm. (Ramsay and Ogilby.)

New Guinea.

THRISSOCLES MALABARICA (Bloch)

Clupea malabaricus Bloch, Naturg. ausländ. Fische, vol. 9, p. 115, pl. 432, 1795 (type locality: Tranquebar).—Schneider, Syst. Ichth. Bloch, p. 425, 1801 (Indian Sea).

Clupea malabarica Lacépède, Hist. Nat. Poiss., vol. 5, p. 425, 1803 (description in key).—Cuvier, Règne animal, vol. 2, p. 176, 1817 (reference).

Clupea malabar Lacépède, Hist. Nat. Poiss., vol. 5, p. 549, 1803 (Malabar).

Thryssa malabaricus Swainson, Nat. Hist. Animals, vol. 2, p. 293, 1839 (on Bloch).

Engraulis malabaricus Valenciennes, Hist. Nat. Poiss., vol. 21, p. 63, pl. 609, 1848 (Bombay).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 74, 1853 (reference).—Day, Fishes of Malabar, p. 239, 1865.—Günther, Cat. Fishes British Mus., vol. 7, p. 395, 1868 (Malabar).—Day, Fishes of India, pt. 4, p. 625, pl. 157, fig. 5, 1878 (Sind).—Meyer, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 42, 1885 (North Celebes).—Day, Fauna Brit. India, Fishes, vol. 1, p. 389, fig. 121, 1889.—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 36, 1913 (copied Day).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 356, 1929 (Travancore).

Thryssa cuvieri Swainson, Nat. Hist. Animals, Fishes, vol. 2, p. 293, 1839 (on *Poorwa* Russell, Fishes of Coromandel, vol. 2, p. 75, pl. 194, 1803, type locality: Vizagapatam).

Depth 2$\frac{9}{10}$; head 4. Snout 5 in head, slightly protrudes; eye 4½ to 4⅔, greater than snout, 1½ in interorbital; maxillary reaches gill opening, expansion 1½ in eye; fine teeth in jaws and on palate; interorbital rather high. Lower gill rakers 21 to 25, ½ of eye.

Scales 39 or 40 in medial lateral series; 11 or 12 transversely. Abdominal scutes 17+9 or 10.

D. I–II or III, 12, first branched ray 1⅕ in head; A. II or III, 38 to 40, first branched ray 2⅕, fin base 2⅚ in combined head and body to caudal base; caudal 3⅚, well forked; least depth of caudal peduncle 2¼ in head; pectoral 1⅓; ventral 2⅓.

Silvery, shot with gold and purple. Black venules on shoulder close behind gill opening. Fins yellow. Dorsal and end of caudal edged with dark. Pectoral sometimes, but not usually, dark or black. (Day.)

India, East Indies. Length given by Valenciennes, 150 mm.

THRISSOCLES KAMMALENSIS (Bleeker)

Engraulis kammalensis BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 13, 1849 (type locality: Madura Straits near Kammal and Surabaja); Atlas Ichth. Ind. Néerland., vol. 6, p. 131, 1866–72 (Java, Madura, Bali, Banka, Sumatra, Singapore, Borneo, Celebes).—DAY, Fishes of India, pt. 4, p. 626, pl. 157, fig. 1, 1878 (Orissa); Fauna Brit. India, Fishes, vol. 1, p. 390, 1899.—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 35, 1913 (Bleeker's specimen).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat., Genova, ser. 3, vol. 10, p. 621, 1926 (Sarawak).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 71, p. 2, 1927 (Benkoelen, Sumatra).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 113, 1929 (Cochin China).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 20, fig. 15, 1929 (Amoy).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 104, 1931 (Bagan Si Api Api).—CHEVEY, Inst. Océanogr. Indochine, 19ᵉ note, p. 9, 1932 (Indo-China).

Engraulis kammelensis SUVATTI, Index Fish. Siam, p. 15, 1937 (Gulf of Siam; Samut Prakan).

Stolephorus (Thrissa) kammalensis BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (7) 265, fig. 2, 1866–72.

Stolephorus kammalensis RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 64 (compiled).

Scutengraulis kammalensis FOWLER, Hong Kong Nat., vol. 2, p. 200, 1931 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 26, 1937 (reference).—HERRE and MEYERS, Raffles Mus. Bull., No. 13, p. 13, 1937 (Sumatra coast 100 miles west of Singapore; Muar, Johore).

Thryssa kammalensis HARDENBERG, Treubia, vol. 15, livr. 3, 228, 1936 (Pontianak; Peniti R., Borneo).

Thrissocles kammalensis FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 131, fig. 3, 1937 (Paknam); List Fish. Malaya, 1938, p. 35 (reference).

Engraulis rhinorhynchos BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 40, 1852 (type locality: Batavia, Surabaja, Kammal).—MARTENS, Preuss. Exped. Ost.-Asien, vol. 1, p. 404, 1876 (Singkawang in Borneo).

Engraulis rhinorhynchus KNER, Reise *Novara*, Fische, p. 334, 1865 (Java).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 394, 1868 (Java; Sarawak).—DAY, Proc. Zool. Soc. London, 1869, p. 384 (Chanderpore).—ELERA, Cat. Fauna Filip., vol. 1, p. 580, 1895 (Cebu).

Engraulis rhinorrhynchus SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 5, p. 107, 1881 (Swatow).

Engraulis chefuensis GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 158, 1874 (type locality: Chefoo).

Engraulis boelama (not Forskål) SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 491, pl. 49, fig. 1, 1891 (Mauritius).

Depth 3¼ to 3⅖; head 3¾ to 4. Snout very prominent; eye 3 to 3½, long as snout; maxillary reaches gill opening, expanded above mandibular joint, tapers behind; teeth in jaws, on vomer, palatines, pterygoids and tongue; upper surface of head with median keel. Lower gill rakers 27, spinulous.

Scales 35 to 38 in medial lateral series; 9 or 10 transversely. Scales thin, not readily deciduous, with anastomosing lines forming fine network posteriorly. Abdominal scutes 15+8.

D. I, 13 or 14, origin behind ventral origin or midway between snout tip and caudal base, height twice its length, equals head without snout; A. 32 to 35, origin behind dorsal origin, length 3 in body length; pectoral rays 11 or 12, long as or little longer than postorbital part of head; ventral rays 7, less than half of head.

Silvery, darker above. Across nape usually blackish spot, reaching downwards to scapula. Fins hyaline, dorsal and caudal usually blackish along margin. Length to 112 mm. (Weber and Beaufort.)

India, Ceylon, Malacca, East Indies, Philippines, China.

THRISSOCLES HAMILTONII (Gray)

Thrissa hamiltonii GRAY, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 92, fig. 3, 1832-34 (no locality). (*Coilia hamiltoni* Gray not involved.)

Thrissa hamiltoni SAUVAGE, Bull. Soc. Philomath., Paris, ser. 7, vol. 5, p. 107, 1881 (Swatow).

Trichosoma hamiltonii SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, p. 292, 1839 (reference).—JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 28, p. 194, 1905 (Korea).

Trichosoma hamiltoni RUTTER, Proc. Acad. Nat. Sci. Philadelphia, p. 66, 1897 (compiled).—JORDAN and METZ, Mem. Carnegie Mus., vol. 6, No. 1, p. 8, 1913 (Fusan).

Engraulis hamiltoni VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 66, 1848 (Bombay; Pondicherry).—BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 32, 1861 (Singapore).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 258, 1927 (Philippines).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore); Service Océanogr. Pêches Indochine, 6^e note, p. 113, 1929 (Cochin China).

Engraulis hamiltonii DAY, Fishes of Malabar, p. 239, 1865.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 395, 1865 (China, Moluccas, Sumatra, Pinang).—DAY, Fishes of India, pt. 4, p. 625, pl. 177, fig. 4, 1878 (Sind).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, 1883, p. 209, 1884 (Lower Burdekin River); vol. 9, p. 58, 1884 (compiled).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 2, p. 94, 1885 (Bassieu, Irrawadi).—DAY, Fauna Brit. India, Fishes, vol. 1, p. 389, 1889.—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 9, 1889, p. 350, 1890 (Rangoon).—ELERA, Cat. Fauna Filip., vol. 1, p. 580, 1895 (Luzon, Cavite, Santa Cruz).—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 104, 1928 (Bombay; Philippine example).

Stolephorus hamiltoni BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 261, 1863 (Wahai, Ceram); vol. 2, p. 176, 1865 (Siam; compiled).

Stolephorus (*Thrissa*) *hamiltoni* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (1)259, fig. 5, 1866-72.

Anchovia hamiltonii JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27 (1907), p. 236, 1908 (Luzon; Panay).

Thrissocles hamiltoni FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 133, 1925 (reference).—MORI, Journ. Pan-Pacific Res. Inst., vol. 2, p. 3, 1928 (Fusan, Korea).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 22, fig. 17, 1929 (Amoy).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 86, 1934 (Bangkok).—SUVATTI, Index Fish. Siam, p. 18, 1937 (reference).

Thrissocles hamiltonii FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 94, 1935 (Bangkok; Paknam); vol. 89, p. 132, 1937 (Tachin); List Fish. Malaya, p. 35, 1938 (reference).

Setipinna hamiltoni FOWLER, Hong Kong Nat., vol. 2, p. 204, 1931 (reference).

Scutengraulis hamiltoni JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, No. 11, p. 371, 1926 (Calcutta; Penang; Colombo).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 13, 1937 (Singapore).

Scutengraulis hamiltonii MCCULLOCH, Australian Mus. Mem., vol. 5, p. 43, 1929 (reference).—ROXAS, Philippine Journ. Sci., vol. 55, p. 261, pl. 1, fig. 10 (scale), 1934 (Luzon; Leyte).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 25, 1937 (reference).

Thryssa sub-spinosa SWAINSON, Nat. Hist. Animals, vol. 2, p. 293, 1839 (on *Poorawah* Russell, Fishes of Coromandel, vol. 2, p. 72, pl. 189, 1803, type locality: Vizagapatam).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 45, 1851.

Engraulis grayi BLEEKER, Nat. Tijds. Nederland. Indië, vol. 2, p. (472) 492, 1851 (type locality: Rio; Batavia); Versl. Mëded. Akad. Wet. Amsterdam, vol. 12, p. 64, 1861 (Pinang).—KNER, Reise *Novara*, Fische, p. 333, 1865 (Java).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 37, fig. 17, 1913 (Bagan Api Api, Sumatra).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 106, 1931 (Bagan Si Api Api).—CHEVEY, Inst. Océanogr. Indochine, 19^e note, p. 9, 1932 (Cochinchina).—SUVATTI, Index Fish. Siam, p. 15, 1937 (Gulf of Siam; Canthaburi Estuary; Tapi R. below Bandon).

Thryssa poorawah (not Buchanan-Hamilton) JERDON, Madras Journ. Lit. Sci., p. 145, vol. 17, 1851.

Engraulis poorawah BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 132, 1866–72 (Java, Sumatra, Singapore, Bintang, Banka, Borneo, Celebes, Batjan, Ceram).

Thrissocles mystax (not Schneider) FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines).

Depth 3¼ to 4¼; head 3¾ to 4½, width 2⅕ to 2¾. Snout 4⅛ to 5⅕ in head; eye 3½ to 4⅖, greater than snout, greater than interorbital in young to 1⅕ in interorbital with age, entirely covered by adipose lids; maxillary reaches little beyond gill openings or nearly to pectoral origin, sometimes slightly beyond pectoral origin, expansion 1½ to 3 in eye, length equals head; jaws nearly even or snout not projecting; teeth small, uniserial in jaws, smaller and in narrow band on each palatine, none on vomer; interorbital 3⅔ to 4⅕ in head, convexly elevated, with slight median ridge. Gill rakers 9 to 11+12 to 16 lanceolate, 1 to 1⅓ in eye; gill filaments ⅔ of gill rakers.

Scales 43 to 45 in median lateral series to caudal base, deciduous; 12 or 13 transversely, 18 to 22 predorsal. Opercles, cheeks, occipital and scapulary regions venulose, area at suprascapula especially broad. Abdominal serrae 16 to 18+10 or 11. Scales with 4 to 6 transverse radiating striae and with age 4 to 6 parallel close vertical apical striae; circuli minute, vertical.

D. III, 11, I, third simple ray 1⅙ to 1⅖ in head; A. III, 35, I to III, 39, I, third simple ray 1¾ to 1⅞; least depth of caudal peduncle 2⅕ to 2⅘; pectoral 1$\frac{1}{10}$ to 1¼; ventral 2⅘ to 3⅓; caudal 3⅘ to 4 in rest of body, well forked, lobes sharply pointed.

Back brown, sides paler and below whitish. Iris slate. Dark brown on suprascapula. Fins all pale, dorsal and caudal dark gray marginally.

India, Burma, Siam, Pinang, Singapore, East Indies, Philippines, Cochinchina, Korea, Queensland.

8863, 8864. Catbalogan, Samar. April 15, 1908. Length, 126–195 mm.
6543. Iloilo market. March 28, 1908. Length, 200 mm.
15 examples. Malampaya River, Palawan. December 26, 1908. Length, 77–115 mm.
5155. Manila market. December 12, 1907. Length, 138 mm.
6534 to 6537, 6539 to 6541, 6544. Off Daet. June 15, 1909. Length, 156–190 mm.
6908 to 6912. Tacloban market. July 25, 1909. Length, 157–204 mm.
11822, 11823. Sandakan market, Borneo. March 2, 1908. Length, 157–168 mm.
1 example. Sebatic Island, Borneo. October 1, 1909. Length, 70 mm.
1 example. Sebatic Island. November 3, 1909. Length, 78 mm.
U.S.N.M. No. 51510. Korea. P. L. Jouy. Length, 86 mm.
U.S.N.M. No. 72272. Iloilo. R. C. McGregor. Length, 115 mm.
3 examples. A.N.S.P. Bombay, India. Dr. F. Hallberg. Length, 165–175 mm.
2 examples. A.N.S.P. Philippines. Commercial Museum of Philadelphia. Length, 178–225 mm.

THRISSOCLES MYSTAX (Schneider)

Clupea mystax SCHNEIDER, Syst. Ichth. Bloch, p. 426, pl. 83, 1801 (type locality: Malabar).—CUVIER, Règne animal, ed. 2, vol. 2, p. 323, 1829 (reference).

Thryssa mystax RICHARDSON, Ichth. China Japan, p. 309, 1846 (Seas of China and India).

Engraulis mystax VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 67, 1848 (India).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, pt. 2, p. 1289, 1849 (Pinang, Malay Peninsula, Singapore).—BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 43, 1852 (Batavia, in sea); (Bengal), vol. 25, p. 74, 1853 (reference); Atlas Ichth. Ind. Néerland., vol. 6, p. 132, 1866–72 (Java, Madura, Sumatra, Singapore, Banka, Borneo).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 397, 1868 (Bombay, Madras, Java).—DAY, Fishes of India, pt. 4, p. 625, pl. 157, fig. 3, 1878.—KLUNZINGER, Sitzungsber. Akad. Wiss., Wien, math.-nat. Kl., vol. 80, p. 416, 1879 (Queensland).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 9, p. 58, 1884 (copied).—DAY, Fauna British India, Fishes, vol. 1, p. 390, 1889.—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 592, 1912 (Batavia).—WEBER and BEAUFORT, Fishes of Indo-Australian Archipelago, vol. 2, p. 38, 1913 (Batavia).—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 174, 1923 (Nontaburi); Mem. Asiatic Soc. Bengal, vol. 6, p. 481, 1924 (Singora).—FOWLER, Mem. Bishop Mus., vol. 10, p. 32, 1928 (Bonin Islands).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 356, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e note, pp. 29, 114, 174, 1929 (Hicé).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 600, 1930 (Hong Kong).—HARDENBERG, Treubia vol. 13, livr. 1, p. 106, 1931 (Bagan Si Api Api).—CHEVEY, Inst. Océanogr. Indochine, 19^e note, p. 9, 1932 (Annam).—SUVATTI, Index Fish. Siam, p. 15, 1937 (Gulf of Siam; Phuket; Maenam Canthaburi).

Stolephorus (*Thrissa*) *mystax* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (3) 261, fig. 2, 1866–72.

Thrissocles mystax Fowler, Copeia, No. 58, p. 62, 1918 (Philippines); Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 94, 1935 (Bangkok; Kaknam); vol. 89, p. 132, 1937 (Paknam; Tachin).—Herre and Myers, Raffles Mus. Bull. No. 13, p. 13, 1937 (Pulau Ubin, Singapore).

Scutengraulis mystax McCulloch, Australian Mus. Mem., vol. 5, p. 43, 1929 (Queensland).—Roxas, Philippine Journ. Sci., vol. 55, p. 261, pl. 1, fig. 8 (scale), 1934 (Luzon; Samar; Panay; Negros).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 26, 1937 (reference).

Anchovia mystax Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 20, 1931 (Fusan).

Setipinna mystax Fowler, Hong Kong Nat., vol. 2, p. 203, 1931 (reference).

Thryssa porava (not Buchanan-Hamilton) Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 14, 1849 (Madura Strait near Kammal, Surabaja and Sampang).

Engraulis poorawah Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 148, 1874 (on *Thryssa mystax* Richardson).—Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 592, 1912 (Batavia).

Trichosoma porava Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 65, (Swatow).

Engraulis mystacoides Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 42, 1852 (type locality: Batavia, Surabaja, Samarang, Pasuruan, Tjilatjap, Bancallong, Kammal, Sumanap).—Günther, Cat. Fish. Brit. Mus., vol. 7, p. 396, 1868 (type of *Engraulis mystacoides*, Amoy, China, East Indies).—Elera, Cat. Fauna Filip., vol. 1, p. 580, 1895 (Luzon, Cavite, Santa Cruz).

Stolephorus mystacoides Bleeker, Nederland. Tijdschr. Dierk., vol. 2, p. 57, 1865 (Amoy).

Thryssa mystacoides Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 24, fig. 18, 1929 (Amoy).

Engraulis hamiltoni (not Gray) Kner, Reise *Novara*, Fische, p. 334, 1865 (Java).

Engraulis hamiltonii Günther, Cat. Fishes British Mus., vol. 7, p. 395, 1868 (part).

Depth 3⅞ to 4¼; head 4 to 4⅗, width 2½ to 2⅘. Snout 4⅓ to 5 in head; eye 4 to 5, greater than snout to subequal with age, greater to subequal with interorbital; maxillary reaches beyond gill opening or to pectoral origin, expansion 1⅖ to 1⅘ in eye, length 3½ to 4⅔ in combined head and body to caudal base; teeth fine, irregularly biserial in jaws, extend along entire maxillary edge; interorbital 4⅕ to 5 in head, convexly elevated. Gill rakers 9 to 11+16 or 17, equal eye; gill filaments ⅗ gill rakers.

Scales (pockets) 40 to 42 in median lateral series to caudal base; 11 or 12 transversely, 20 to 24 predorsal. Abdominal serrae 17 or 18+10 to 12. Scales with 3 or 4 transverse striae; circuli as fine, close-set, vertical, parallel striae.

D. iii, 9, i, to iii, 11, i, first branched ray 1⅕ to 1½ in head; A. iii, 33, i, to iii, 36, i, first branched ray 1⅓ to 1⅞; least depth of caudal peduncle 2½ to 3⅓; pectoral 1⅕ to 1½; ventral 2½ to 3⅕; caudal 3⅗ to 4⅕ in rest of body.

Back neutral gray, sides and below, also iris, bright silvery white. Suprascapula with many dark gray or blackish, parallel, close-set, short horizontal lines. Dorsal and caudal pale brownish, other fins tinged yellowish.

India, Malaya, East Indies, Siam, Indo-China, China, Philippines, Queensland.

U.S.N.M. No. 6424. Bonin Islands. William Stimpson. Length, 200 mm.

U.S.N.M. No. 72522. Batavia, Java. 1909. Bryant and Palmer. Length, 132 mm. Maxillary reaches pectoral origin. Lower gill rakers 15. As *Engraulis poorawah.*

U.S.N.M. No. 72524. Java. Bryant and Palmer. Length, 175 mm.

4 examples. A.N.S.P. Honk Kong. April 1929. Henry W. Fowler. Length, 139–228 mm.

THRISSOCLES PURAVA (Buchanan Hamilton)

Clupea purava Buchanan-Hamilton, Fishes of Ganges, pp. 238, 382, 1822 (type locality: Ganges estuaries).

Engraulis purava Valenciennes, Hist. Nat. Poiss., vol. 21, p. 65, 1848 (mouth of Ariantoupang River, Coromandel).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1290, 1849 (Pinang).—Bleeker, Verh. Batav. Genootsch. (Bengal.), vol. 25, p. 74, 1853 (reference); Atlas Ichth. Ind. Néerland., vol. 6, p. 135, 1866–72 (compiled).—Günther, Cat. Fishes British Mus., vol. 7, p. 397, 1868 (Kurrachee, Cochin, Calcutta).—Day, Fishes of India, pt. 4, p. 628, pl. 157, fig. 2, 1878 (Sind); Fauna British India, Fishes, vol. 1, p. 393, 1889.—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 39, 1913 (compiled).—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 30, No. 1, p. 40, 1924 (Calicut).—Fowler and Bean, Proc. U. S. Nat. Mus., vol. 71, p. 2, 1927 (Benkoelen, Sumatra).—Fowler, Mem. Bishop Mus., vol. 10, p. 32, 1928 (Bonin Islands).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 356, 1929 (Travancore).

Thrissocles purava Fowler, List Fish. Malaya, p. 36, 1938 (reference).

Clupea mystus (not Linnaeus) Cuvier, Règne animal, ed. 2, vol. 2, p. 323, 1829 (on *Peddah poorawah* Russell, Fishes of Coromandel, vol. 2, p. 73, pl. 190, 1803, Vizagapatam).

Thryssa megastoma Swainson, Nat. Hist. Animals, Fishes, vol. 2, p. 293, 1838 (on *Peddah poorawah* Russell).

Engraulis samam Thiollière, Fauna Woodlark, p. 209, 1857 (Woodlark Island).

Engraulis hornelli Fowler, Journ. Bombay Nat. Hist. Soc., vol. 30, No. 1, p. 41, 1924 (type locality: Calicut).

Depth 3 to 3¼; head 3¾ to 3⅘, width 2½ to 2⅗. Snout 4 to 4¼ in head; eye 3⅓ to 3¾, greater than snout, equals eye, lids not free; maxillary reaches slightly beyond gill opening, not to pectoral, slender; teeth very small, uniserial in jaws, extend along lower maxillary edge to its hind end; interorbital 3⅓ to 3¾, convex; opercle smooth. Gill rakers 16+17, twice gill filaments or 1⅕ in eye.

Scales 35 to 40 in median lateral series to caudal base and 3 more on latter, very caducous. Abdominal serrae 15 or 16+9. Scales with 9 or 10 vertical parallel striae, often incomplete, apical usually closed and even with few annectent branches; circuli fine, vertically parallel.

D. III, 10, I or III, 11, I, first branched ray 1⅙ to 1⅖ in head; A. III, 35, I, to III, 39, I, first branched ray 1⅘ to 1⅞; least depth of caudal peduncle 2¼ to 3; caudal 1 to 1⅛, deeply forked, slender lobes pointed; pectoral 1⅕ to 1⅓; ventral 2⅓ to 2⅔.

Pale brownish generally. No silvery lateral band. Sides of head with silvery sheen. Iris silvery white. Fins pale, dorsal and pectoral dusted with dusky terminally, also hind caudal edge. Small dark blotch at crown and several pale dusky specks at snout tip. Humeral venules dusky. Iris silvery white.

India, Pinang, East Indies, Bonin Islands, Melanesia. The distinctions for *Engraulis mystax* and *Engraulis purava* as given by Weber and Beaufort do not seem to hold with my material. All my specimens show the anal more than 3 times in the length, which they attribute to *Engraulis mystax*, in addition giving 13 lower gill rakers. None of my specimens show the anal length 2⅔ times in length of the fish.

For the present I admit *Thrissocles purava* as having a shorter maxillary, never quite reaching the pectoral origin, whereas in *Thrissocles mystax* it at least reaches the pectoral origin and may extend about ¼ in fin length. Knowing the maxillary character a variable one, I feel that this arrangement is purely tentative and that possibly the two species are not really distinct.

U.S.N.M. No. 72521. Batavia, Java. 1909. Bryant and Palmer. Length, 148–150 mm. 2 examples. Both with 13 lower gill rakers.

U.S.N.M. No. 86564. Bonin Islands. William Stimpson. Length, 165 mm. Lower gill rakers 10+12; abdominal scutes 15+12.

A.N.S.P. Calicut, India. James Hornell. Length, 79–96 mm. Four examples. Types of *Engraulis hornelli*.

THRISSOCLES VITIROSTRIS (Gilchrist and Thompson)

Engraulis vitirostris GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 201, 1908–11 (type locality: Natal; Inner Harbour, Durban).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 64, 1913 (Natal).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 296, 1917 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia 1925, p. 195 (Delagoa Bay).

Thryssa vitirostris BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 118, pl. 6, fig. 5, 1925 (East London, Natal, Delagoa Bay, Chinde).

Thrissocles vitirostris FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 413, 1934 (St. Lucia; Durban, Natal); vol. 87, p. 366, 1935 (Durban).

Depth 3⅓ to 3⅖; head 4 to 4⅒, width 2½ to 2⅘. Snout 5 in head; eye 3⅘ to 4½, greater than snout, subequal with interorbital; maxillary reaches little beyond pectoral origin or to first fifth of pectoral; mandible 1¼ to 1⅓ in head; interorbital 3¾ to 3⅘, convexly elevated; head above and humeral region strongly venulose. Gill rakers 15+21, lanceolate.

Scales 44 in medial lateral series to caudal base; each with 11 transverse striae, of which 2 to 6 sometimes complete medially. Abdominal scutes 16+10.

D. III, 9, first branched ray 1⅓ to 1½ in head; A. III, 35 to 37, origin below bases of last dorsal rays, first branched ray 1$\frac{9}{10}$ to 2; least depth of caudal peduncle 2⅗ to 2⅔; pectoral 1¼; ventral 2¾ to 2⅘; caudal 3½ to 3¾ in rest of fish, forked.

Back brown, sides and below silvery white. Iris white. Fins pale, dorsal and caudal grayish.

South Africa.

2 examples. A.N.S.P. Delagoa Bay. Portuguese East Africa. 1922. Length, 163–168 mm.

THRISSOCLES SETIROSTRIS (Broussonet)

Clupea setirostris BROUSSONET, Ichth., vol. 1, no pagination, pl. 2, 1782 (type locality: Pacific Ocean near Tanna Island, Society Group); Tabl. Ichth., p. 186, pl. 76, fig. 316, 1788 (Pacific Ocean; Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1407, 1789 (Pacific Ocean; Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 41, 1792 (copied).—SCHNEIDER, Syst. Ichth. Bloch, p. 428, 1801 (Pacific Ocean).—LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 425, 459, 1803 (Arabia, Great Equinoxial Ocean).—CUVIER, Règne animal, vol. 2, p. 176, 1817 (reference); ed. 2, vol. 2, p. 323, 1829 (reference).

Engraulis setirostris VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 69, 1848 (India).—BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 44, 1852 (Batavia; Surabaja; Kammal; Bangcallang); (Bengal.), vol. 25, p. 74, 1853 (reference); Atlas Ichth. Ind. Néerland., vol. 6, p. 134, 1866–72 (Java, Madura, Bali, Sumatra, Nias, Banka, Celebes, Amboina).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 397, 1868 (Indian Archipelago).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 118, 1874 (Chinese drawing).—DAY, Fishes of India, pt. 4, p. 626, 1878; Fauna British India, Fishes, vol. 1, p. 391, 1889.—ELERA, Cat. Fauna Filip., vol. 1, p. 581, 1895 (Luzon, Manila).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 157, 1907 (Gischin).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 267, 1908–11 (Natal).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 379, 1909 (on Forster).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 64, 1913 (Natal).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 7, 1913 (Macassar and Sulibabu Island).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 40, fig. 18, 1913 (Batavia and Puger; Makassar; Beira, East Africa).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, No. 4, p. 296, 1917 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 258, 1927 (Philippines); Mem. Bishop Mus., vol. 10, p. 32, 1928 (compiled).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e note, pp. 29, 114, 174, 1929 (Hué).—GILTAY, Mem. Mus. Roy. Nat. Hist. Belg., ser. 5, vol. 3, p. 20, 1933 (Kema Bay, Celebes).—SUVATTI, Index Fish. Siam, p. 15, 1937 (Gulf of Siam; Phuket; Maenam Canthaburi).

Engraulis (Thrissa) setirostris MARTENS, Preuss. Exped. Ost Asien, vol. 1, p. 404, 1876 (Bangkok).

Stolephorus setirostris BLEEKER, Nederland. Tijdschr. Dierk., vol. 2, p. 291, 1865 (reference).

Stolephorus (*Thrissa*) *setirostris* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (3) 261, fig. 1, 1866–72.

Anchovia setirostris JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27, p. 237, 1908 (Aparri).—OGILBY, Mem. Queensland Mus., vol. 2, p. 92, 1913 (Cooktown).

Thrissocles setirostris FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 133, 1925 (reference).—MCCULLOCH, Australian Mus. Mem., vol. 5, p. 44, 1929 (Queensland).—CHEVEY, Inst. Océanogr. Indochine, 19° note, p. 9, 1932 (Amman).—HERRE, Fishes Herre Philippine Exped. 1931, p. 15, 1934 (Bauang Sur; Capiz).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 413, 1934 (Natal).—ROXAS, Philippine Journ. Sci., vol. 55, p. 259, pl. 1, fig. 6, 1934 (Luzon; Mindoro).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 25, 1937 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 132, 1937 (Paknam).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 13, 1937 (Singapore).—FOWLER, List Fish. Malaya, p. 36, 1938 (reference).

Clupea mystacina (Forster) SCHNEIDER, Syst. Ichth. Bloch, p. 428, 1801 (name in synonymy).—LICHTENSTEIN, Descr. Anim. Forster, p. 295, 1844 (type locality: Tanna Island).

Thryssa macrognathos BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 13, 1849 (type locality: Madura near Bangcallang, Kammal, and Surabaya).

Depth 3½ to 4¾; head 4 to 4⅕, width 2¼ to 2½. Snout 5¾ to 4½ in head; eye 3½ to 4, greater than snout, greater than interorbital in young to subequal with age; maxillary reaches to depressed ventral ends, to depressed pectoral tips in young, expansion 1½ to 1⅘ in eye, length 2 to 2⅖ in combined head and body to caudal base; interorbital 3¾ to 4, convexly elevated. Gill rakers 5+12, slender, lanceolate, equal gill filaments which 1½ in eye.

Scales 40 to 42 in median lateral series to caudal base and 3 or 4 more on latter; 12 transversely, 18 or 19 predorsal. Abdominal serrae 18+8 or 9. Scales with 11 or 12 short marginal basal striae, of which 1 may be complete vertically; circuli as very fine, parallel, close-set, transverse or vertical striae.

D. III, 10 or III, 11, with procumbent spine before dorsal origin, first branched ray 1⅒ to 1⅛ in head; A. III, 33, I or III, 34, I, inserted below bases of last dorsal rays, first branched ray 1⅖ to 1½ in head; least depth of caudal peduncle 2 to 2⅙; pectoral 1 to 1⅒; ventral 1⅔ to 2; caudal 3⅖ to 3⅔ in rest of body, deeply forked, slender lobes pointed.

Back light brown, sides and lower surfaces bright silvery white. Iris silvery white. Fins pale brownish, hind caudal edge grayish. Shoulder with gray adipose area with parallel horizontal dusky venules.

Red Sea, Arabia, East Africa, Natal, India, Siam, East Indies, Philippines, China, Queensland, Polynesia.

1 example. A.N.S.P. Philippines. Commercial Museum of Philadelphia. Length, 123 mm.
1 example. A.N.S.P. Durban, Natal. H. W. Bell Marley. 1929. Length, 120 mm. ?
1 example. A.N.S.P. Durban. H. W. Bell Marley. 1932. Length, 92 mm.
2 examples. A.N.S.P. Paknam, Siam. R. M. de Schauensee. 1936. Length, 51–109 mm.

THRISSOCLES DUSSUMIERI (Valenciennes)

Engraulis dussumieri Valenciennes, Hist. Nat. Poiss., vol. 21, p. 69, 1848 (no locality).—Bleeker, Verh. Batavia, Genootsch. (Haring.), vol. 24, p. 43, 1852 (Batavia, in sea).—Kner, Reise *Novara*, Fische, p. 333, 1865 (Java).—Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 118, 1874 (Chinese drawing).—Day, Fishes of India, pt. 4, p. 627, pl. 158, fig. 4, 1878 (Madras); Fauna British India, Fishes, vol. 1, p. 391, 1889.—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol 2, p. 41, 1913 (Bleeker's specimen).—Seale, Philippine Journ. Sci., vol. 9, p. 59, 1914 (Hong Kong).—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 30, No. 1, p. 40, 1924 (Calicut); vol. 32, p. 253, 1927 (Bombay); Mem. Bishop Mus., vol. 10, p. 32, 1928 (Bonin Islands).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 356, 1929 (Travancore).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^{e} note, p. 4, 1929 (Cochin China).—Hardenberg, Treubia, vol. 13, livr. 1, p. 106, 1931 (Bagan Si Api Api; Anei R.).—Chevey, Inst. Océanogr. Indochine, 19^{e} note, p. 9, 1932 (Indochine).—Herre, Fishes Herre Philippine Exped. 1931, p. 15, 1934 (Dumaguete).—Hora and Mukerji, Rec. Indian Mus., vol. 38, p. 18, 1936 (Maungmagau, Burma).—Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 25, 1937 (reference).—Suvatti, Index Fish. Siam, p. 14, 1937 (Gulf of Siam; Phuket; Tha-cin).

Engraulis dussumierii Bleeker, Atlas Ichth. Ind. Nèerland., vol. 6. p. 133, 1866–72 (Java; Singapore).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 622, 1926 (Sarawak).

Stolephorus (*Thrissa*) *dussumieri* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, pl. (2) 260, fig. 2, 1866–72.

Anchovia dussumieria Seale, Philippine Journ. Sci., vol. A 3, p. 513, 1908 (Philippines).

Thrissocles dussumieri McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 133, 1925 (reference).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 13, 1937 (Singapore; off Malacca; Muar, Johore).—Fowler, List Fish. Malaya, p. 34, 1938 (reference).

Engraulis hamiltoni (not Gray) Valenciennes, Hist. Nat. Poiss., vol. 21, p. 66, 1848 (Bombay; Pondicherry; Malabar).

Engraulis auratus Day, Proc. Zool. Soc. London, p. 312, 1865 (type locality: Cochin, Malabar); Fishes of Malabar, p. 238, pl. 19, fig. 2, 1865.

Engraulis mystax (not Schneider) Günther, Cat. Fish. Brit. Mus., vol. 7, p. 397, 1868 (Bombay, Madras, Java).— ? Klunzinger, Sitzungsber. Akad. Wiss. Wien, math.-nat. Cl., vol. 80, p. 416, 1880.

Trichosoma adelae Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 65, (type locality: Swatow, China).

Depth 3⅓ to 3⅔; head 3⅔ to 3⅘, width 2½ to 2⅘. Snout 5 to 6 in head; eye 3⅘ to 4½, greater than snout, 1 to 1¼ in interorbital; maxillary nearly or quite reaches ventral origin, length 2⅖ to 2½ in combined head and body to caudal base; interorbital 4 to 5¼, convexly elevated. Gill rakers 16 or 17+16 to 20, equal gill filaments or 1⅙ in eye.

Scales 37 or 38 in median lateral series to caudal base and 2 more on latter; 9 transversely, 16 or 17 predorsal. Abdominal scutes 15 or 16+7 or 8. Scales with 9 or 10 vertical parallel striae; circuli as fine vertical parallel striae.

D. III, 9, I, or III, 10, I, first branched ray 1⅕ to 1½ in head; A. III, 29, I, to III, 32, I, first branched ray 1⅘ to 2, base 3⅕ to 3⅓ in combined head and body to caudal base; caudal 1 to 1⅚ in head, slender lobes pointed, equal; least depth of caudal peduncle 2⅕ to 2⅖; pectoral 1⅕ to 1⅖; ventral 2 to 2⅓.

Pale brownish above, sides silvery white, without pale lateral band. Fins pale, edges of caudal lobes slightly dusky. Humeral venules slightly dusky and with obsolete dusky band crossing predorsal anteriorly to opposite humeral membranes.

India, Singapore, East Indies, Philippines, China, Japan, Bonin Islands.

5 examples. A. N. S. P. Calicut. James Hornell. 1922. Length, 105–116 mm.
1 example. A. N. S. P. Bombay. Prof. F. Hallberg. 1925. Length, 138 mm.

THRISSOCLES VALENCIENNESI (Bleeker)

Stolephorus (*Thryssa*) *valenciennesi* BLEEKER, Nederland. Tijdschr. Dierk., vol. 3, p. 306, 1866 (type locality: Java, Sumatra, Singapore, Borneo).

Stolephorus (*Thrissa*) *valenciennesi* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (2)260, fig. 6, 1866-72.

Engraulis valenciennesi BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 133, 1866-72 (Java, Sumatra, Pinang, Singapore, Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 42, 1913 (Palabuan Batu, Java).—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 32, p. 254, 1927 (Bombay); Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 258, 1927 (Orani).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 25, 1937 (reference).

Engraulis valenciennes FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 71, p. 2, 1927 (Benkoelen, Sumatra).

Anchovia valenciennesi FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang, Sumatra).

Thryssa valenciennesi FOWLER, Proc. Acad. Nat. Sci. Philadelphia, p. 220, 1911 (Padang examples).

Thrissocles valenciennesi FOWLER, List Fish. Malaya, p. 25, 1938 (reference).

Engraulis hamiltoni (not Gray) VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 66, 1848 (part).

Engraulis hamiltonii DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 185, 1904.

Engraulis mystacoides (part) GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 396, 1868 (copied).

Depth 3⅓ to 3½; head 4⅓ to 5, width 2⅕ to 5. Snout 5 to 5¾ in head; eye 4 to 5⅕, greater than snout, subequal with interorbital, lids not free; maxillary reaches slightly beyond pectoral base, expansion 1⅓ to 1⅗ in eye, length 3¾ to 3⅘ in combined head and body to caudal base; interorbital 3⅔ to 4⅛ in head, convex. Gill rakers 10 to 12+14 to 17, lanceolate, slender, 1¼ in eye.

Scales 38 or 39 (mostly fallen) in medial lateral series to caudal base and 3 more on latter; 10 to 13 transversely, 19 or 20 predorsal to occiput. Scales very thin, cycloid; with 6 to 10 vertical striae, interrupted at median axis; circuli fine. Abdominal scutes 16+9.

D. III, 9, I, first branched ray 1⅛ to 1⅕ in head; A. III, 41 to III, 44, I, first branched ray 1½; least depth of caudal peduncle 1⅞ to 2; ventral 2½ to 2⅔; caudal forked, 3⅘ to 3⅞ in rest of length; pectoral 3⅞ to 4⅕.

Edge of back olivaceous brown, sides and below silvery white. Gray venulose area at scapular region moderate. Iris slate. Fins all pale or whitish, hind caudal edge gray.

India, Pinang, Singapore, East Indies, Philippines.

2 examples, A.N.S.P. Bombay, India. Prof. F. Hallberg. 1925. Length, 150–177 mm.

1 example, A.N.S.P. Padang, Sumatra. A. C. Harrison and H. L. Hiller. Length, 148 mm. In arrack largely silvery, back dull olivaceous brown. Sides of head silvery white, also iris. No silvery lateral band. Humeral venules yellowish green, with horizontal waved lines. Peritoneum silvery. Dorsal and caudal pale gray to dusky, medially tinged yellowish green. Other fins pale or whitish.

6 examples, A.N.S.P. Orani, Luzon. Rev. Joseph Clemens. 1923. Purchased. Length, 112–124 mm.

Subgenus THRISSINA Jordan and Seale

THRISSOCLES BAELAMA (Forskål)

Clupea baelama FORSKÅL, Descript. Animal., p. 72, 1775 (type locality: Djedda, Red Sea).—SCHNEIDER, Syst. Ichth. Bloch, p. 429, 1801 (Red Sea).

Clupea boelama WALBAUM, Artedi Pisc., vol. 3, p. 42, 1792 (copied).

Engraulis boelama VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 35, 1848 (Seychelles, Mauritius, Red Sea, Massawah, Amboina).—GUICHENOT, Notes Ile Réunion, vol. 2, p. 29, 1863.—GÜNTHER, Fishes of Zanzibar, p. 123, 1866 (Zanzibar).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 130, 1866–72 (Amboina; Ceylon).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 393, 1868 (Zanzibar; Koseir).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 597, 1871 (Koseir, Red Sea).—GÜNTHER, Proc. Zool. Soc. London, 1871, p. 671 (Red Sea; Zanzibar; Mysol; Manado).—PETERS, Monatsb. Akad. Wiss. Berlin, 1875, p. 445, 1876 (Mauritius).—DAY, Fishes of India, pt. 4, p. 626, pl. 158, fig. 7, 1878 (Port Blair).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 491, 1891 (not fig.; part).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 4, p. 228, 1898 (Guam).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 157, 1907 (Scheich Othman).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 379, 1909 (Red Sea; East Indies).—BAMBER, Journ. Linn. Soc. London, vol. 31, Zool., p. 478, 1915 (Sudanese Red Sea).—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, vol. 45, ser. 3, p. 14, 1935–36 (Massaua).

Engraulis baelama DAY, Fauna British India, Fishes, vol. 1, p. 391, 1889.—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 33, 1913 (Nias, Lombok, Aru Islands).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 258, 1927 (Santa Maria); Mem. Bishop Mus., vol. 10, p. 32, 1928 (New Guinea); vol. 11, no. 5, p. 315, 1931 (reference).—HERRE, Mid-Pacific Mag., vol. 10, No. 2, p. 163, April–June 1935 (Pelew Islands).

Engraulis balaema CHABANAUD, Service Océanogr. Pêches Indochine, 1^e note, p. 8, 1926 (Tonkin).

Stolephorus boelama BLEEKER, Nederland. Tijdschr. Dierk., vol. 2, p. 291, 1865 (reference).

Stolephorus (*Engraulis*) *boelama* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (2)260, fig. 1, 1866–72.

Anchovia boelama SMITH and SEALE, Proc. Biol. Soc. Washington, vol. 19, p. 75, 1906 (Rio Grande, Mindanao).—SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27, 1907, p. 236, 1908 (Cagayancillo; Iloilo).

Thrissina baelama HERRE, Fishes Herre Philippine Exped. 1931, p. 25, 1934 (Panay; Cebu; Mindanao).—ROXAS, Philippine Journ. Sci., vol. 55, p. 263, pl. 1, fig. 7 (scale), 1934 (Luzon; Leyte; Panay; Bantayan; Mindanao; Samal).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 25, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 59, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 13, 1937 (Muar, Johore).

Thrissocles baelama FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, 1934 (Den Pasar; Sanoer, Bali); vol. 87, p. 94, fig. 14, 1935 (Bangkok; Paknam; Sriracha): List Fish. Malaya, p. 34, 1938 (reference).

Engraulis nesogallicus BENNETT, Proc. Comm. Zool. Soc. London, vol. 1, p. 168, 1831 (type locality: Mauritius).

Engraulis encrasicholoides BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 37, 1852 (type locality: Batavia, Surabaja, Kammal).—KNER, Reise, *Novara*, Fische, p. 333, 1865 (Java).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 130, 1866–72 (Java, Madura, Bali, Sumatra, Celebes, Timor, Ternate, Batjan, Amboina, Saparua, Ceram, Banda).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 387, 1868 (type).—SCHMELTZ, Cat. Mus. Godeffroy, No. 4, p. 25, 1869 (Savay); No. 7, p. 58, 1879 (Savaii).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 593, 1882 (New Guinea); vol. 8, 1883, p. 278, 1884 (Hood Bay, New Guinea).—STEINDACHNER, Abh. Senck. Ges., vol. 25, p. 456, 1900 (Ternate).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 592, 1912 (Batavia).—WEBER, *Siboga* Exped., vol. 57, Fische, p. 6, 1913 (Bima, Flores, Macassar, Sulu, Menado, Siau, Salibabu, West Ceram).—TIRANT, Service Océanogr. Pêches Indo-China, 6^e note, p. 112, 1929 (Cochin China).

Stolephorus encrasicholoides BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 236, 1863 (reference); vol. 2, p. 176, 1865 (Siam; reference).

Stolephorus (*Engraulis*) *encrasicholoides* BLEEKER, Atlas Ichth. Ind. Néerland. vol. 6, pl. (5)263, fig. 4, 1866–72.

Anchovia encrasicholoides FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang, Sumatra); Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 219 (same material).

Engraulis polynemoides GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 394, 1868 (type locality: Madagascar).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 491, pl. 49, fig. 2, 1891 (Madagascar).

Anchovia evermanni JORDAN and SEALE, Bull. Bur. Fisher., vol. 25, 1905, p. 188, fig. 4, 1906 (type locality: Apia, Samoa).

Engraulis evermanni GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 379, 1909 (New Pomerania).

Engraulis macrops KISHINOUYE, Journ. Coll. Agric. Tokyo, vol. 2, p. 385, 1911 (type locality: Habajima, Bonin Islands).—FOWLER, Mem. Bishop Mus., vol. 10, p. 32, 1928 (copied).

Engraulis macropus KISHINOUYE, Journ. Coll. Agr. Tokyo, vol. 2, pl. 30, fig. 3, 1911.

Depth 4½ to 4⅖; head 3½ to 3¾, width 2⅖ to 2½. Snout 4⅘ to 5½ in head; eye 3⅘ to 4½, greater than snout or interorbital, adipose lids covering eye; maxillary reaches slightly beyond mandible joint, though not quite to gill opening, expansion 1⅞ to 2 in eye, length 1⅛ to 1⅕ in head; maxillary with minute uniserial teeth, scarcely enlarged posteriorly and not continuous across mouth front; mandible with similar teeth, smaller, erect; small patch of minute teeth each side of vomer, series on each palatine and patch on each pterygoid; interorbital 3½ to 4⅓, evenly convex; cheek and opercle smooth. Gill rakers 15+19, slender, 1⅕ in eye; gill filaments 1½ in eye.

Scales 37 or 38 in median lateral series to caudal base and 3 or 4 more on latter; 9 to 11 transversely, 14 to 20 predorsal. Caudal scaled, outer portions finely so. Dorsal and anal with broad basal scaly sheaths. Pectoral scaly flap 1½ to 1¾ in fin, ventral flap 1⅔ to 1⅞ its length. Abdominal serrae 5 or 6+9 or 10, begin behind pectoral base. Scales with 14 or 15 variable though largely vertical striae; circuli fine, transversely parallel.

D. III, 10, I to III, 12, I, first branched ray 1⅓ to 1⅖ in head; A. III, 26, I or III, 27, I, first branched ray 1⅞ to 3⅛; least depth of caudal peduncle 2⅗ to 3⅛; pectoral 1⅖ to 1½; ventral 1⁹⁄₁₀ to 2; caudal 1 to 1⅒, well forked.

Back and head above dull olivaceous brown, line of demarcation along side of body indistinct. Sides of head and trunk silvery white, also iris. Dorsal and caudal grayish, other fins whitish. Peritoneum silvery.

Red Sea, Arabia, Zanzibar, Mauritius, Reunion, Seychelles, India, East Indies, Siam, Philippines, Melanesia, Micronesia, Polynesia. Known by its short maxillary, absence of silvery lateral band and the abdominal scutes beginning behind pectoral base.

Engraulis polynemoides Günther seems to be a synonym of the present species, with both the scales and anal rays given as 35. *Engraulis macrops* Kishinouye is likely another synonym, with abdominal serrae 6+7.

26 examples. Basun River, Tawi Tawi Islands. September 23, 1909. Length, 83–110 mm. All with small adherent scales and metallic reflections of purplish.

7 examples. Batangas, Luzon. June 7, 1908. Length, 102–131 mm.

20077. Blackwater ponds of Putoc River, Mindanao. January 30, 1909. Length, 128 mm.

8167 [1864]. Cebu market. August 29, 1909. Length, 90 mm.

1 example. Cotabato, Rio Grande, Mindanao. Length, 99 mm. "Caebulan" local name.

467 examples. Gomomo Island. December 3, 1909. Length, 27–52 mm. Brilliant silvery white sides and lower surface, not defined as silvery lateral band.

1 example. Iloilo market. June 1, 1908. Length, 120 mm.

7 examples. Jolo market. February 11, 1908. Length, 79–110 mm.

35 examples. Murcielagos Bay, Mindanao. August 20, 1909. Length, 42–75 mm.

1 example. North end of Endeavor Strait, Northwest coast of Palawan Island. December 22, 1908. Length, 67 mm.

22619. Paluan River, Mindoro. December 11, 1908. Length, 84 mm.

1 example. Port Dupon, Leyte. March 17, 1909. Length, 102 mm.

5 examples. Pucot River, Mareveles. January 29, 1909. Length, 95–100 mm.

8819, 8820, 9542. Santiago River, Pagapas Bay, Luzon. February 20, 1909. Length, 88–130 mm. 10 examples.

6 examples. Varadero Bay, Mindoro. July 23, 1908. Length, 41–49 mm.

1 example. San Vicente Harbor, Luzon shore. November 13, 1908. Length, 30 mm.

1 example. Zamboanga. October 1909. Length, 33 mm.

D. 5595. Zamboanga Light, N. 31° W., 0.1 mile (lat. 6°54′00″ N., long. 122°04′30″ E.). October 7, 1909. Length, 32–39 mm. 4 examples.

L. 8. Danawan and Si Amil Island, Borneo. September 26, 1909. Length, 100 mm.

4 examples. Tifu Bay, Bouru Island. December 10, 1909. Length, 26–28 mm.

U.S.N.M. No. 13214. Mauritius. Col. N. Pike. Length, 117 mm.

U.S.N.M. No. 19992. Mauritius. Length, 99 mm.

U.S.N.M. No. 56236. Bureau of Fisheries (No. 4217). Length, 93 ? mm.

U.S.N.M. No. 57915. Zamboanga. Dr. E. A. Mearns. Length, 38–100 mm. 43 examples.

U.S.N.M. No. 57953. Zamboanga. Dr. E. A. Mearns. Length, 37–65 mm. 2 examples.

U.S.N.M. No. 72249. Cagayancillo. R. C. McGregor. Length, 45–90 mm. 7 examples.

U.S.N.M. No. 72523. Batavia, Java. Bryant and Palmer. 1909. Length, 127 mm. Shows single scute just behind isthmus. As *Engraulis encrasicholoides*.

Genus SETIPINNA Swainson

Setipinna Swainson, Nat. Hist. Animals, vol. 2, p. 292, 1839. (Type, *Setipinna megalura* Swainson=*Clupea phasa* Buchanan-Hamilton, designated by Swain, Proc. Acad. Nat. Sci. Philadelphia, 1882, p. 280.)

Stethochaetus Gray, Cat. Fish Gronow, p. 174, 1854. (Type, *Stethochaetus biguttatus* Gronow, monotypic.)

Telara Günther, Cat. Fish. Brit. Mus., vol. 7, p. 400, 1868. (Type, *Clupea telara* Buchanan-Hamilton, tautotypic.)

Heterothrissa Günther, Cat. Fishes British Mus., vol. 7, p. 401, 1868. (Type. *Engraulis breviceps* Cantor, monotypic.)

Body rather long, deepest forward, narrowing behind. Abdominal scutes strong, extend from gill openings to vent. Lower jaw included within upper. Maxillary moderate, expanded behind; not reaching beyond gill opening. Teeth small, even. Gill rakers 10 to 18 below. Vertebrae 45 or 46. Scales caducous. Free spine before dorsal. Anal base very long, rays 50 to 75, inserted just before or behind front of dorsal. Uppermost pectoral ray produced.

Rather large species with long anal fin and the upper pectoral ray filamentous. Jordan and Seale think the anal rays of the *Stethochaetus biguttatus* Gray were misprinted 36 for 63, thus eventuating *Stethochaetus* Gray here accepted as a subgenus in place of *Heterothrissa*.

ANALYSIS OF SPECIES

a^1. SETIPINNA. Lower jaw not projecting.
  b^1. Anal origin before dorsal origin.
    c^1. Lower gill rakers 10; A. 49 to 53 ---------------------------- melanochir
    c^2. Lower gill rakers 18; A. 72 to 75 ---------------------------- phasa
  b^2 Anal origin below dorsal, well behind dorsal origin; lower gill rakers 15 or 16; A. 51 to 60 ---------------------------- taty
a^2. STETHOCHAETUS. Lower jaw projects; lower gill rakers 13; A. 60 to 66 ---------------------------- breviceps

Subgenus SETIPINNA Swainson

SETIPINNA MELANOCHIR (Bleeker)

Engraulis melanochir BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 13, 1849 (type locality: Madura Strait near Kammal and Surabaja).—SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 7, p. 151, 1883 (Menam).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^e note, pp. 111, 174, 1929 (Thudaumot, Phuoc Hai, Baria).—BORODIN, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (Saigon).

Coilia melanochir BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 9, p. 418, 1855 (Bandjermassing, Borneo).

Stolephorus melanochir BLEEKER, Versl. Med. Akad. Wet. Amsterdam, vol. 16, 1864, p. 353, 1864 (Bangkok); Nederland. Tijdschr. Dierk., vol. 2, p. 35 (Siam), p. 176, 1865 (Siam; compiled).

Stolephorus (Setipinna) melanochir BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (9) 267, fig. 3, 1866–72.

Setipinna melanochir BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 136, 1866–72 (Java, Madura, Sumatra, Borneo).—RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 66 (reference).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 28, fig. 15, 1913 (Palembang, Ojambi, Bagan Api Api, Bunut).—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, No. 2, p. 174, 1923 (Nontaburi); Mem. Asiatic Soc. Bengal, vol. 6, p. 491, 1924 (Tale Sap).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 620, 1926 (Sarawak).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1^e note, p. 8, 1926 (Cambodia).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 101, 1931 (Bagan Si Api Api); vol. 15, livr. 3, p. 227, 1936 (Kapuas R., Borneo).—SUVATTI, Index Fish. Siam, p. 16, 1937 (Bangkok; Khlong Ban Pho; Songkhla; Bangkham; Gulf of Siam; Thale Nor; Thale Sap; Maenam Bangpakong).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 132, 1937 (Tachin).

Telaa melanochir SAUVAGE, Bull. Soc. Philom., Paris, ser. 7, vol. 5, p. 107, 1881 (Swatow). (Error.)

Setipinna lighti (Herre) WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 26, fig. 20, 1929 (type locality: Amoy).

Depth 3⅛ to 3¼; head 5, width 2¼ to 2⅞. Snout 5⅖ to 5¾ in head; eye 5, greater than snout, 1¼ to 1⅓ in interorbital; maxillary reaches mandibular joint or preopercle ridge, expansion 1⅙ to 1⅕ in eye, length 1⅒ to 1⅛ in head; teeth feeble; interorbital 4⅛ to 4⅖, broadly convex. Gill rakers 7 to 9+10 to 12, lanceolate, equal eye; gill filaments ⅘ gill rakers.

Scales (pockets) 44 to 46 in median lateral series to caudal base and 3 or 4 more on latter; 16 or 17 transversely, 34 to 36 predorsal. Abdominal scutes 20 to 22+8 or 9. Scales with 15 to 18 short, marginal, basal striae, apically with reticulations; circuli as fine, transverse, close set striae basally, none apical on scale.

D. III, 10 or III, 11, with procumbent spine before origin, first branched ray 1 to 1⅒ in head; A. III, 46 or III, 47, first branched ray 1½, origin slightly before dorsal origin; caudal 4¾ in rest of body, well forked, broad lobes pointed; pectoral 4⅓ to 5; ventral 2 to 2¾ in head; least depth of caudal peduncle 2.

Back drab to olive brown, sides and entire lower surfaces silvery white. Fins all pale, grayish marginally. Pectoral dusky to blackish basally, and on inner rays. Iris silvery white.

Siam, East Indies, Cochin China, China. My examples agree with Weber and Beaufort's figure and description largely, though show more abdominal scutes. The pectoral filament in the larger one reaches a little beyond ventrals.

11732. Sandakan market, Borneo. March 2, 1908. Length, 244 mm.
U.S.N.M. No. 48000. Cochinchina. Lyons Museum. Length, 193 mm.

SETIPINNA PHASA (Buchanan-Hamilton)

Clupea phasa BUCHANAN-HAMILTON, Fishes of Ganges, pp. 240, 382, 1822 (type locality: Brackish rivers of Bengal).

Engraulis phasa VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 59, 1848 (copied).

Clupea telara BUCHANAN-HAMILTON, Fishes of Ganges, pp. 241, 382, pl. 2, fig. 72, 1822 (type locality: High up in the Ganges).

Engraulis telara VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 56, pl. 608, 1848 (Ganges mouth; Rangoon).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. (74)147, 1853 (Calcutta).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 401, 1868 (Cachar and Hooghly).—DAY, Fishes of India, pt. 4, p. 627, pl. 158, fig. 2, 1878 (Calcutta, Bengal, Orissa, Cachar, Burma, Mandalay); Fauna British India, Fishes, vol. 1, p. 392, 1889.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 111, 174, 1929 (Cochinchina).

Telara telara FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 220 (Ganges River, India).

Setipinna telara JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, p. 365, 1926 (Rangoon, Burma).

Septipinna telara CHEVEY, Inst. Océanogr. Indochine, 19 ͤ note, p. 8, 1932 (Cochinchina) (error).

Setipinna truncata SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, p. 292, 1839 (on *Clupea telara* Buchanan-Hamilton, Fishes of Ganges, p. 241, pl. 2, fig. 72, 1822).

Setipinna megalura SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, p. 292, 1839 (on *Clupea phasa* Buchanan-Hamilton, Fishes of Ganges, p. 240, 1822).

Engraulis brevifilis VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 54, 1848 (type locality: Bengal).

Depth 4 to 4⅗; head 5½ to 5¾, width 2½ to 2⅗. Snout 4¾ to 5¾ in head; eye 3⅔ to 4½, greater than snout or interorbital; maxillary reaches gill opening, expansion 1⅔ to 1¾ in eye, length equals head, with minute, uniserial teeth its whole edge; similar mandibular teeth smaller; few minute asperities on palatines anteriorly; interorbital 3⅘ to 4, convex; cheek and opercles smooth. Gill rakers 14 or 15+18, slender points, 1⅕ to 1¼ in eye; gill filaments 1⅓ to 1⅘ in eye.

Scales 58 to 60 ? (pockets) in median lateral series to caudal base and 3 ? more on latter; 17 transversely, 30 predorsal. Caudal base scaly. Abdominal scutes 16+6. Scales with 4 to 6 short basal marginal striae and 5 or 6 transverse vertical striae apically; circuli finely concentric on basal half of scale, none apically.

D. II, 12, I, with procumbent spine before origin, first branched ray 1 in head; A. III, 69, I to III, 74, I, first branched ray 1⅞; least depth of caudal peduncle 2 to 2⅘; ventral 2½ to 2⅘; caudal (damaged) 4¼ in rest of body, well forked; pectoral 1⅗ to caudal base, with uppermost ray long filament reaching well beyond depressed dorsal.

Pale brownish on back. Sides and entire lower surface silvery white, evidently where scales fallen silvery gray. Iris silvery white. Fins all pale or whitish, dorsal and caudal little grayish terminally.

India, Burma. Though both of my specimens in poor preservation they clearly show the characters of this species.

U.S.N.M. No. 44724. Rangoon, Burma. L. Fea. Length, 163 mm., caudal tips damaged. As *Engraulis telara*.

1 example. A.N.S.P. Ganges River, India. Dr. Marmaduke Burrough. Length, 103 mm., caudal tips damaged.

SETIPINNA TATY (Valenciennes)

Engraulis taty VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 60, 1848 (type locality: Pondicherry; Malacca).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1288, 1849 (Pinang; Malay Peninsula).—BLEEKER, Verh. Batav. Genootsch. (Haring), vol. 24, p. 36, 1852 (Batavia; Surabaja; Sambang; Kammal); (Bengal), vol. 25, p. 74, 1853 (reference).—DAY, Fishes of Malabar, p. 240, 1865.—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 400, 1868 (Bengal, Pinang, Java).—DAY, Fishes of India, pt. 4, p. 628, pl. 158, fig. 5, 1878 (Orissa); Fauna British India, Fishes, vol. 1, p. 393, 1889.—

Duncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 185, 1904 (no locality).—Lloyd, Rec. Indian Mus., vol. 1, p. 221, 1907 (Akyab).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 111, 1929 (Phuquoc, Phuoc-hai, Thudaumot).

Engraulis (*Telara*) *taty* Martens, Preuss. Exped. Ost Asien, vol. 1, p. 404, 1876 (Singkawang in Borneo).

Stolephorus taty Bleeker, Nederland. Tijdschr. Dierk., vol. 2, p. 176, 1865 (Siam; compiled).

Stolephorus (*Setipinna*) *taty* Bleeker, Atlas Ichth. Ind. Neérland., vol. 6, pl. (2) 260, fig. 7, 1866–72.

Setipinna taty Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 136, 1866–72 (Java, Madura, Sumatra, Pinang, Singapore, Banka, Borneo).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 30, 1913 (Batavia, Balikpapan).—Hora, Mem. Asiatic Soc. Bengal, vol. 6, p. 481, 1924 (Singora).—Jordan and Seale, Bull. Mus. Comp. Zool., vol. 67, p. 366, 1926 (Siam; Java; Colombo, Ceylon).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 621, 1926 (Sarawak).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 600 (1930) (Hong Kong).—Hardenberg, Treubia, vol. 13, livr. 1, p. 102, 1931 (Bagan Si Api Api).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 96, 1935 (Paknam).—Hardenberg, Treubia, vol. 15, livr. 3, p. 228, 1936 (Kapuas R., Borneo).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 132, 1937 (Bangkok).—Suvatti, Index Fish. Siam, p. 17, 1937 (Gulf of Siam; Klong Ranot; Uhonburi).—Herre and Meyers, Raffles Mus. Bull. No. 13, p. 13, 1937 (Muar, Johore; Singapore coast 100 miles west of Sumatra).—Fowler, List Fish. Malaya, p. 34, 1938 (reference).

Septipinna taty Chabanaud, Inst. Océanogr. Chine, 19ᵉ note, p. 8, 1932 (Cochinchina; Phu-Quôc) (error).

Engraulis tenuifilis Valenciennes, Hist. Nat. Poiss., vol. 20, p. 62, 1847 (type locality: Rangoon).

Engraulis telaroides Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 13, 1849 (type locality: Madura Straits near Kammal and Surabaja and Sampang).

Setipinna gilberti Jordan and Starks, Proc. U. S. Nat. Mus., vol. 28, p. 194, fig. 1, 1905 (type locality: Chemulpo, Korea).—Jordan and Metz, Mem. Carnegie Mus., vol. 6, p. 8, 1913 (Fusan).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan and Mokpo, Korea).

Depth 3⅔; head 4¾ to 5, width 2⅖ to 3. Snout 6 in head; eye 4 to 4¼, greater than snout, equals interorbital; maxillary reaches preopercle angle, expansion 1 to 1¼ in eye, length 1 1/10 to 1⅛ in head; teeth in narrow nearly or quite uniserial bands in jaws, above extend along whole maxillary edge; inteorbital 4 to 4¼, convexly elevated. Gill rakers 12 or 13+15 or 16, lanceolate, much greater than gill filaments or equal eye.

Scales 44 (pockets) in median lateral series to caudal base and 4 more on latter; 13 transversely, 20 to 30 ? predorsal. Abdominal serrae 18+8. Scales with 12 short basal marginal striae and 4 or 5 apical; circuli entirely over scale surface, mostly parallel and vertical or transverse.

D. III, 10, I or III, 11, I, procumbent spine before origin, first branched ray 1¼ to 1⅕ ? in head; A. III, 53, I to III, 57, I, origin opposite dorsal origin, first branched ray 1⅘ to 1⅞; least depth of caudal peduncle 2¾ to 2⅘; ventral 2¼ to 2⅘; caudal 4¾ to 5 in rest of body; pectoral 3⅓ to 4, ends in filament nearly or quite reaching anal.

Back drab gray, sides and below, also iris, silvery white. Fins pale, lower ones little more brownish.

India, Burma, Malay Peninsula, Pinang, East Indies, China, Korea. There is little to contend for *Setipinna gilberti* as it readily agrees with my Hong Kong example. Jordan and Starks say it is more slender than either *Setipinna melanochir* or *Setipinna taty*, and though they give the depth as 3⅘ their figure clearly shows it 3⅔. Its anal rays given as 57 are hardly not beyond the range of variation as Weber and Beaufort give 51 to 56. There is nothing in the figure of *Setipinna gilberti* to maintain it as distinct from *Setipinna taty*.

U.S.N.M. No. 37766. Chemulpo, Korea. 1884–1885. Ensign J. B. Bernadou. Length, 141 mm. to end of broken caudal. Type of *Setipinna gilberti*.

One example. A.N.S.P. Hong Kong. Henry W. Fowler. April 26, 1929. Length, 167 mm.

Subgenus STETHOCHAETUS Gray

SETIPINNA BREVICEPS (Cantor)

Engraulis breviceps CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1288, 1849 (type locality: Pinang).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 401, 1868 (type; type of *Engraulis pfeifferi*).—DAY, Fishes of India, pt. 4, p. 628, 1878 (Bengal Bay); Fauna British India, Fishes, vol. 1, p. 392 1889.—? ELERA, Cat. Fauna Filip., vol. 1, p. 581, 1895 (Luzon, Cavite, Santa Cruz).—DÜNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 185, 1904 (Kuala Lumpur).—LLOYD, Rec. Indian Mus. vol. 1, p. 221, 1907 (Akyab).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 112, 174, 1929 (Phuquoc, Phuoc-Hai, Thudaumot, Cochinchina).—BORODIN, Bull. Vanderbilt Marine Mus., vol. 1, p. 42, 1930 (Saigon).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 101, 1931 (Bagan Si Api Api).

Setipinna breviceps BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 137, 1866–72 (Pinang; Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 29, 1913 (Bagan Api Api).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 621, 1926 (Sarawak).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1ᵉ note, p. 8, 1926 (Cambodia).—HARDENBERG, Treubia, vol. 15, livr. 3, p. 227, 1936 (Telok Pekadai, Borneo).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 13, 1937 (Singapore).—FOWLER, List Fish. Malaya, p. 34, 1938 (reference).

Stethochaetus breviceps JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, p. 364, 1926 (compiled).

Engraulis pfeifferi BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. (408) 433, 1852 (type locality: Pontianak, Borneo).

Stolephorus (*Setipinna*) *pfeifferi* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (5) 263, fig. 3, 1866–72.

Coilia pfeifferi Sauvage, Bull. Soc. Philom. Paris, ser. 7, vol. 6, p. 175, 1882 (Poula-Condor).

Stethochaetus biguttatus Gray, Cat. Fish. Gronow, p. 174, 1854 (type locality: India).—Jordan and Seale, Bull. Mus. Comp. Zool., vol. 67, p. 364, 1926 (note).

Depth 3⅔; head (damaged) 5¼, width 3. Snout 6½ in head from snout tip; eye 6½, equals snout, 1½ in interorbital; maxillary reaches hind preopercle edge though not to gill opening, expansion 1⅛ in snout, length 1⅓? in head from snout tip; interorbital 5, broadly convex. Gill rakers 10+13, lanceolate, twice gill filaments or 1¼ in interorbital.

Scales 48 (damaged) in median lateral series to caudal base and 4 more on latter; 13 transversely, 25 predorsal. Abdominal serrae 18+9. Scales with 37 radiating arched basal striae, meeting complete apical reticulations; circuli finely concentric basally, none apical.

D. iii, 15, first branched ray (damaged) about 5 in combined head and body to caudal base; A. ii, 62, origin well before that of dorsal, first branched ray (damaged) 1⅞?; caudal 1, deeply forked, lobes pointed and lower little longer; least depth of caudal peduncle 2; ventral 2⅖; pectoral with uppermost ray ending in long filament extending back at least little beyond hind dorsal base or half way to caudal base.

Body brown with brassy tints, gray to silvery gray on skin where scales fallen. Iris gray. Fins brownish. Dorsal creamy basally, grayish terminally. Pectoral dusky terminally, long filament brown.

India, Malay Peninsula, Pinang, East Indies, Cochin China. Reported from the Philippines only by Elera. This species is the genotype of Gunther's *Heterothrissa*, distinguished chiefly by its protruding straight mandible or lower jaw and long anal inserted well before dorsal.

U.S.N.M. No. 48003. Cochin China. Lyons Museum. Length, 265 mm.

Genus ENGRAULIS Cuvier

Engraulis Cuvier, Règne animal, vol. 2, p. 174, 1817. (Type, *Clupea encrasicholus* Linnaeus, designated by Jordan, Tanaka, Snyder, Journ. Coll. Sci., Tokyo, vol. 33, p. 38, 1913.)

Encrasicholus Fleming, British Animals, p. 183, 1828. (Type, *Clupea encrasicholus* Linnaeus, tautotypic.)

Austranchovia Whitley, Australian Zoologist, vol. 6, p. 311, 1931. (Type, *Atherina australis* Shaw, orthotypic.)

Body partly cylindrical. No abdominal scutes. Maxillary not extending to gill opening. Lower gill rakers 36 to 49. Vertebrae 46 or 47. Alar scales at caudal base large. Anal short, inserted behind front of dorsal.

Species of cool or temperate shores of the globe. *Engraulis brevipinnis* Heckel is described from the Upper Miocene of Chiavenna. The two species described below I am unable to satisfactorily diagnose from my materials, the Australian very poorly preserved. Following custom I accept them provisionally.

ENGRAULIS AUSTRALIS (Shaw)

Atherina australis SHAW, Voy. New South Wales, White, p. 296, pl. 64, fig. 1, 1790 [type locality: New South Wales (=between Broken Bay and Botany Bay)].

Engraulis australis McCOY, Official Rec. Intercolonial Exhib. Melbourne, p. 319, 1866.—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 41, pt. 1, p. 14, 1879 (Hobsons Bay, Victoria).—McCULLOCH, Rec. Australian Mus., vol. 13, p. 43, pl. 12, fig. 1, 1920 (Southwest Australia, Tasmania, Victoria, New South Wales, South Australia, southern Queensland, New Zealand).—WAITE, Rec. South Australian Mus., vol. 2, p. 35, fig. 50, 1921.—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—WHITLEY, Australian Zoologist, vol. 4, p. 228, 1926 (North West Islet; 50 vomited by white-capped noddy).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 15, pl. 4, fig. 49a, 1927.

Engraulis encrasicholus var. *antipodum* GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 386, 1868 (type locality: Van Diemens Land and New Zealand).—HUTTON, Trans. New Zealand Inst., vol. 5, p. 270, 1873.—JOHNSTONE, Proc. Roy. Soc. Tasmania, 1882, pp. 92, 132, 1883; 1890, p. 37, 1891.—KENT, Naturalist in Australia, p. 155, 1897.

Engraulis antipodum WAITE, Mem. New South Wales Nat. Club, No. 2, p. 13, 1904.—WAITE, Rec. Canterbury Mus., vol. 1, No. 1, p. 9, 1907 (reference).—STEAD, Edible fishes New South Wales, p. 28, 1908.—ZIETZ, Trans. Roy. Soc. South Australia, vol. 32, p. 294, 1908.—OGILBY, Proc. Roy. Soc. Queensland, vol. 21, p. 23, 1908 (Southport).—WAITE, Rec. Canterbury Mus., vol. 1, No. 4, p. 317, 1912 (reference).—McCULLOCH, Rec. West Australian Mus., vol. 1, p. 213, 1914.—OGILBY, Commercial Fish. Fisher. Queensland, p. 47, 1915 (Brisbane).—JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, p. 392, 1926 (Victoria).

Engraulis antarcticus CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 186, 1872 (type locality: Melbourne).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 365, 1880 (compiled); vol. 6, p. 257, 1881 (reference).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 37, 1890 (Victoria).

Engraulis encrasicholus (not Linnaeus) HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes of New Zealand), p. 62, 1872 (compiled).

Engraulis heterolobus (not Rüppell) KLUNZINGER, Arch. Naturg., vol. 38, p. 42, 1872 (Hobson's Bay); Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, pt. 1, p. 415, 1880 (Cleveland Bay).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 9, p. 57, 1884 (compiled).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 37, 1890 (reference).

Anchoviella heterolobus McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).

Anchoviella mauii FOWLER and BEAN, Proc. U. S. Nat. Mus. vol. 63, p. 4, 1923 (type locality: "Maui, Hawaiian Islands").

Engraulis mauii FOWLER, Mem. Bishop Mus., vol. 10, p. 33, 1928 (type).

Depth 5 to 5¾; head 3¼ to 3⅖, width 2¾ to 2⅘. Snout 4⅛ to 4⅓ in head; eye 3¼ to 3½, greater than snout or interorbital; maxillary not quite reaching hind preopercle ridge, length 1⅖ to 1½ in head; teeth extremely fine, minute; interorbital 4 to 4½, low convex. Gill rakers 30+27 (young) to 40, finely and slenderly lanceolate, twice length of gill filaments or ⅞ of orbit.

Scales about 35 (pockets) in median lateral series to caudal base; 9 (pockets) transversely between dorsal and ventral origins; 17 (pockets) predorsal forward to occiput. No spines on median line of belly or abdomen.

D. ii, 12, first branched ray 1⅔ to 1⅘ in head; A. ii, 19 or 20, first branched ray about 2⅗; caudal 1¼ to 1⅖; least depth of caudal peduncle 3 to 3¼; pectoral 1⅞ to 2; ventral 2¼ to 2⅖.

Pale brown generally, head with silvery white reflections. Iris silvery white. Broad, ill-defined, gray-white lateral band, perhaps revealed due to all scales having fallen. Fins uniformly pale.

Queensland, New South Wales, Victoria, South Australia, Tasmania, New Zealand.

U.S.N.M. No. 82904. "Maui, Hawaiian Islands." Locality erroneous, doubtless temperate Australia or New Zealand. U. S. Exploring Expedition. Length, 75 mm. (caudal damaged). Type of *Anchoviella mauii*. Also paratype, same data, 77 mm.

U.S.N.M. No. 48825. Maroubra, New South Wales. J. D. Ogilby. 41 examples. Length, 34–50 mm.

U.S.N.M. No. 48825. Maroubra, New South Wales. J. D. Ogilby. 2 examples. Length, 58–64 mm.

ENGRAULIS JAPONICA (Houttuyn)

Atherina japonica Houttuyn, Verh. Holland. Maatsch. Haarlem, vol. 20, p. 340, 1782 (type locality: Japan).—Gmelin, Syst. Nat. Linn., vol. 1, p. 1397, 1789 (copied).—Schneider, Syst. Ichth. Bloch, p. 111, 1801 (copied).

Engraulis japonicus Schlegel, *in* Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 239, pl. 108, fig. 3, 1846 (southwest Japan).—Bleeker, Verh. Batav. Genootsch. (Japan), vol. 25, p. 18, 1853 (reference); (Japan), vol. 26, pp. 6, 119, 1857 (Nagasaki); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 3, p. 6, 1858 (Japan); vol. 5, No. 9, p. 3, 1859 (Nagasaki).—Namiye, Classification Cat., p. 109, 1881 (Tokyo).— ? Elera, Cat. Fauna Filip., vol. 1, p. 580, 1895 (Luzon, Cavite, Santa Cruz).—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 54, 1901 (reference).—Jordan and Starks, Proc. U. S. Nat. Mus., vol. 28, p. 194, 1905 (Gensan, Korea).—Jordan and Herre, Proc. U. S. Nat. Mus., vol. 31, p. 638, 1906 (Otaru, Hakodate, Same, Aomori, Onomichi, Wakanoura, Misaki, Tokyo, Tsuruga, Nagasaki).—Kishinouye, Journ. Imp. Fisher. Bur. Tokyo, vol. 14, pl. 20, fig. 1, 1907.—Franz, Abh. Bayer. Akad. Wiss., vol. 4, Suppl. vol. 1, p. 5, 1910 (Fukuura and Onagava Bay).—Snyder, Proc. U. S. Nat Mus., vol. 42, p. 403, 1912 (Otaru, Misaki, Hakodate).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 183, 1920 (Hizen).—Jordan and Seale, Bull. Mus. Comp. Zool., vol. 67, p. 391, 1926 (Tokyo).—Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Genzan and Fuzan, Korea).—Soldatov and Lindberg, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 42, 1930 (Far East seas).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 20, 1931 (Kagoshima).

Engraulis japonica GÜNTHER, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 72, 1880 (inland Sea of Japan; Kobe).—TANAKA, Jap. Fish. Life Colours, No. 46, 1933.

Stolephorus japonicus BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 148, 1874 (references).—RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 64 (Swatow).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 54, 1901 (Japan).—JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 770, 1905 (Philippines).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 24, 1937 (reference).

Anchovia japonica SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 462, 1906 (Susaki).

Engraulis commersonianus (not Lacépède) RICHARDSON, Ichth. China Japan, p. 308, 1846 (Seas of China).

Engraulis ringens (not Jenyns) ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 9, 1897.

Depth 5¾ to 6; head 3⅗ to 3⅘, width 2⅞ to 3⅓. Snout 4⅓ to 5¼ in head; eye 3⅘ to 4⅓, greater than snout or interorbital; maxillary not quite reaching hind ridge of preopercle, length 1⅓ to 1⅖ in head; interorbital 5½ to 5⅞, convexly elevated. Gill rakers 34+36, finely lanceolate, equal eye; gill filaments ⅘ gill rakers.

Scales very caducous, most all fallen in preserved examples, 39 to 41 (pockets) in median lateral series to caudal base; 8 transversely, 20 or 21 predorsal. Pectoral axillary scale ⅘ length of fin, ventral axillary scale ¾ fin length. Abdominal serrae absent. Scales with 6 to 8 marginal striae; circuli fine, largely transverse.

D. III, 13, I, or III, 12, I, first branched ray 1⅔ to 1⅘ in head; A. II or III, 14, I to 16, I, first branched ray 2⅔ to 3; caudal 1¼ to 1⅓, deeply forked, lobes rather slender and sharp pointed; least depth of caudal peduncle 3⅔ to 4; pectoral 1¾ to 1⅘; ventral 2⅖ to 2½.

Back brown, also upper surface of head till level with upper eye edge. Sides and lower surface of body silvery white. Iris silvery white. Dorsal and caudal brownish, lower fins whitish.

China, Japan, Korea. Reported from the Philippines by Elera, though his reference may have pertained to market specimens from Japan ?

U.S.N.M. No. 44882. Japan. Japanese Government. Length, 120 ?–131 ? mm. 4 examples.

U.S.N.M. No. 45256. Gensan, Korea. P. L. Jouy. Length, 45 and 46 mm. 2 examples.

U.S.N.M. No. 48190. Esan, Japan. S. Nozawa. Length, 125–130 mm. 2 examples.

U.S.N.M. No. 57807. Tsuruga, Japan. Jordan and Snyder. Length, 64–86 mm. 10 examples.

U.S.N.M. No. 59786. Susaki, Japan. Dr. H. M. Smith. Length, 62 mm.

U.S.N.M. No 62330. Aomori, Japan. Jordan and Snyder. Length, 78–100 mm. 2 examples.

U.S.N.M. No. 62331. Onomichi, Japan. Jordan and Snyder. Length, 102–115 mm. 2 examples.

U.S.N.M. No. 71189. Tomakomai, Japan. *Albatross* collection. 1906. Length 52–80 mm. 30 examples.

U.S.N.M. No. 71295. Otaru, Japan. *Albatross* collection. Length, 86–93 mm. 3 examples.

U.S.N.M. No. 71368. Misaki, Japan. *Albatross* collection, 1906. Length, 67–72 mm. 18 examples.

U.S.N.M. No. 82609. Misaki. *Albatross* collection. Length, 118 mm.

Genus ANCHOVIELLA Fowler

Anchoviella Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 211. (Type, *Engraulis perfasciatus* Poey, orthotypic.)

Menidia Browne, Nat. Hist. Jamaica, ed. 2, p. 46, 1789. (Nonbinomial.) (Type, *Atherina browni* Gmelin, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 46, 1917.)

Encrasicholus (Commerson) Lacépède, Hist. Nat. Poiss., vol. 5, p. 458, 1803 (name in synonymy). (Nonbinomial). (Type, *Clupea vittargentea* Lacépède, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 71, 1917.)

Body elongate. Snout prominent. Eye moderate. Maxillary may reach to gill opening. Teeth fine, in jaws, on vomer, palatines, pterygoids and tongue. Gill rakers 25 to 50. Branchiostegals 11 to 13. Scales thin, very deciduous. Preventral spiny scutes not over 7. Dorsal usually without small predorsal spine, entirely or partly before anal. Anal short, rays 15 to 23. Upper pectoral ray not extended.

Small translucent marine fishes always with a distinct silvery lateral band. They live in large schools, feeding upon plankton and nekton.

ANALYSIS OF SPECIES

a^1. Anal rays 13 or 14 ---- **celebica**

a^2. Anal rays 16 to 18 ---- **pseudoheteroloba**

a^3. Anal rays 19 to 23.

  b^1. Anal origin behind dorsal base; D. 13 to 15.

    c^1. Anal length 6 in total length.

      d^1. Scales 35 or 36; maxillary tapers behind, end rounded, reaches hind preopercle edge ---- **heteroloba**

      d^2. Scales 41 to 44; maxillary truncate behind, reaches mandibular joint. **purpurea**

    c^2. Anal length 7 to 7½ in total length; maxillary truncate behind, reaches mandibular joint; scales 38 ---- **zollingeri**

  b^2. Anal origin below dorsal base.

      e^1. Abdominal scutes 8 or 9 between pectorals and ventrals; maxillary reaches gill opening ---- **holodon**

      e^2. Abdominal scutes 6 or 7 between pectorals and ventrals; maxillary reaches gill opening; anal length 5 to 5⅓ in total length.

        f^1. D. 14 ---- **waitei**

        f^2. D. 15 or 16 ---- **commersonii**

      e^3. Abdominal scutes 6 between pectorals and ventrals; maxillary reaches preopercle angle ---- **chinensis**

e^4. Abdominal scutes 4 or 5 (to 8 in *baganensis*) between pectorals and ventrals.
  g^1. Maxillary reaches front edge of preopercle; anal length 5⅔ to 6 in total length------------------------------------ indica
  g^2. Maxillary reaches gill opening.
    h^1. Anal length 4$\frac{9}{10}$ to 5⅓ in total length--------- bataviensis
    h^2. Anal length 4½ to 5 in total length--------------------- tri
    h^3. Anal length 4⅖ to 4⅗ in total length---------- baganensis
a^4. Anal rays 31 to 34.
  i^1. Depth rather over 3; head 4½; dorsal origin midway between snout tip and caudal base---------------- nasuta
  i^2. Depth rather less than 3½; head 3⅘; dorsal origin ⅕ nearer snout tip than caudal base----------------- aestuaria

ANCHOVIELLA CELEBICA (Hardenberg)

Stolephorus celebicus Hardenberg, Nat. Tijdschr. Ned. Indie, vol. 93, p. 262, 1933 (type locality: Menado, Celebes); Treubia, vol. 14, livr. 3, p. 327, fig. 9, 1934 (Menado).

Depth 6 to 6$\frac{7}{10}$; head 3⅖ to 3$\frac{7}{10}$. Snout somewhat shorter than eye; eye 4 to 4⅕ in head; maxillary reaches to mandibulary joint, dilated posteriorly, truncated, space from snout tip, to hind end of maxillary 1⅖ to 1½ in head, 4½ to 5 in body length. Lower gill rakers 23 to 25.

Scales 35 or 36 in lateral series; 8 transversely. Scales not very deciduous, striated. No abdominal scutes. Vertebrae 43 or 44, of which 19 or 20 caudal.

D. 14 or 15, origin postmedian in space between snout tip and first rays of caudal; A. 13 or 14, inserted behind dorsal, 7⅖ to 7½ in length or somewhat longer than snout and eye; space from anal origin to caudal base ½ to ¾ length of pectoral fin shorter than space between anal origin and pectoral base; pectoral rays 15, fin shorter than postorbital part of head; ventral rays 7, fin ⅔ of pectoral.

A silvery lateral band. Black spot on occiput. Back and caudal powdered with black. Other fins hyaline.

Length, 100 mm. (Hardenberg.)

East Indies. Related to *Anchoviella zollingeri*, said to differ chiefly in fin rays, longer head, anal nearer caudal, and without abdominal scutes.

ANCHOVIELLA PSEUDOHETEROLOBA (Hardenberg)

Stolephorus pseudoheterolobus Hardenberg, Nat. Tijdschr. Ned. Indie, vol. 93, pt. 2, p. 261, 1933 (type locality: Riouw and Lingga Archipelago; Moluccas); Treubia, vol. 14, livr. 3, p. 325, fig. 7, 1934 (Java; Sumatra; Celebes; Amboina).

Depth 5⅘ to 6⅕; head 3⅘ to 4⅕. Snout somewhat shorter than eye; eye 3½ to 4 in head; maxillary reaches somewhat behind mandibulary joint, dilated posteriorly, pointed, distance from snout tip to hind end of maxillary $4\frac{2}{5}$ to $4\frac{7}{10}$ in length, $1\frac{1}{5}$ in head. Lower gill rakers 23 to 25.

Scales 38 in lateral series; 9 transversely. Scales very deciduous, scarcely striated. Abdominal scutes 4 to 6, last one remote from ventrals. Vertebrae 43, of which 20 caudal.

D. 14 or 15, origin midway to little behind in space between snout tip and first rays of caudal; A. 16 to 18, origin midway between pectoral base or gill opening and caudal base; fin $5\frac{4}{5}$ to $6\frac{1}{5}$ in length, long as lower jaw, origin behind dorsal; pectoral rays 13 or 14, long as postorbital part of head; ventral rays 7, fin $\frac{2}{3}$ of pectoral.

A silvery lateral band. Black spot on occiput. Back and caudal fin powdered with black. Other fins hyaline.

Length, mature at 65 mm, reaches 100 mm. (Hardenberg.)

East Indies, on Java coast and Moluccas. Said to resemble *Anchoviella heteroloba*, but with shorter maxillary and lower body.

ANCHOVIELLA HETEROLOBA (Rüppell)

Engraulis heterolobus Rüppell, Neue Wirbelth., Fische, p. 79, pl. 21, fig. 4, 1835 (type locality: Red Sea).—Günther, Cat. Fishes British Mus., vol. 7, p. 392, 1868 (Red Sea; East Indies).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 596, 1871 (Koseir); Arch. Naturg., vol. 38, 1872, p. 42 (Hobson Bay); Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, p. 415, 1880 (Cleveland Bay; Hobson Bay).—Macleay, Proc. Linn. Soc. New South Wales, vol. 9, p. 57, 1884 (compiled).—Elera, Cat. Fauna Filip., vol. 1, p. 580, 1895 (Samar).—Steindachner, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 157, 1907 (Gischin).—Weber, *Siboga* Exped., vol. 57, Fische, p. 6, 1913 (Lombok).—Herre, Field Mus. Publ. 353, zool. ser., vol. 21, p. 34, 1936 (Fiji; Solomons).

Engraulis heteroloba Martens, Verh. zool. bot. Ges. Wien, vol. 16, p. 379, 1866 (Koseir, Red Sea).

Stolephorus heterolobus Bleeker, Nederland. Tijdschr. Dierk., vol. 3, p. 305, 1866; Atlas Ichth. Ind. Néerland., vol. 6, p. 126, pl. (7) 265, fig., 1866–72 (Sumatra, Ternate, Amboina).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 44, 1913 (Java Sea, Lombok).—Hora, Mem. Asiatic Soc. Bengal, vol. 6, p. 14, 1924 (Singora).—Chevey, Inst. Océanogr. Indochine, 19e note, p. 8, 1932 (Cochin China; Phu-Quoc; Annam).—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete).—Hardenberg, Treubia, vol. 14, livr. 3, p. 324, fig. 6, 1934 (Java; Kangean Archipelago; Singapore; Bali).—Herre, Fishes Herre Philippine Exped. 1931, p. 16, 1934 (Dumaguete).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 24, 1937 (reference).

Depth 5 to 6; head $3\frac{4}{5}$ to 4, width 5 to $5\frac{1}{5}$. Snout very prominent, shorter than eye; eye $3\frac{1}{5}$ to 4 in head, greater than snout or interorbital; maxillary dilated at mandibulary joint, tapers posteriorly, rounded end reaching hind border of preopercle, length $1\frac{1}{8}$ in head; interorbital $3\frac{4}{5}$ to $4\frac{1}{8}$, convex. Gill rakers 15+22, flattened, slender, 3 times gill filaments, little shorter than eye.

Scales 33 or 34 in medial lateral series to caudal base and 3 more on latter; 8 or 9 transversely, 15 predorsal. Spiny scutes 5 between pectorals and ventrals.

D. III, 10 or III, 11, origin nearer caudal than snout tip, far behind ventral origin, first branched ray $1\frac{3}{4}$ to $1\frac{4}{5}$ in head; A. III, 14, I to III, 15 I, length about 6 in total length, origin just behind last dorsal rays, first branched ray $2\frac{1}{5}$ to $2\frac{1}{4}$; caudal deeply incised, about 5 in total length, or $1\frac{1}{6}$ to $1\frac{1}{5}$ in head; pectoral $1\frac{3}{4}$ to $1\frac{4}{5}$, long as postocular part of head, far distant from ventrals; ventral $2\frac{3}{5}$ to 3 in head, much longer than eye, origin midway between anal and pectoral bases.

Yellowish or pale brown generally with silvery lateral band. Sides of head bright silvery white. Iris same. Fins all pale.

Red Sea, Australia, East Indies. Reported from the Philippines previously by Elera. Known by its prominent snout and the brilliant silvery white lateral band.

1 example. Abuyog, Leyte. July 22, 1909. Length, 44 mm.
4 examples. Baganga Bay, Zambales Province. May 13, 1908. Length, 45–65 mm.
10 examples. 1897. Cebu market. September 4, 1909. Length, 34–70 mm.
9 examples. Masinloc Bay, Zambales Province. November 22, 1908. Length, 55–71 mm.
21 examples. Murcielagos Bay, Mindanao. August 20, 1909. Length, 63–68 mm.
1 example. Nogas Point, Panay. February 3, 1908. Length, 54 mm.
2 examples. Olongapo, East Luzon. January 7, 1908. Length, 69–73 mm.
71 examples. Port Bais Anchorage. November 31, 1908. Length, 33–44 mm.
2 examples. Port Caltom. December 15, 1908. Length, 68 ?–72 mm.
123 examples. Port Dupon, Leyte. March 17, 1909. Length, 34–48 mm.
14 examples. Port Jamelo, Luzon. July 13, 1908. Length, 43–70 mm.
20146, 20147. Port Matalvi, Luzon. November 22, 1908. Length, 65–71 mm.
20198. Sangley Point, Cavite, Luzon. March 23, 1908. Length, 74 mm.
1 example. Santa Cruz, Marinduque. April 23, 1908. Length, 68 mm.
19 examples. Santa Cruz, Marinduque. April 24, 1908. Length, 41–46 mm.
7 examples. Varadero Bay, Mindoro. July 22, 1908. Length 38–47 mm.
4 examples. Varadero Bay. July 23, 1908. Length 47–53 mm.
1 example. Tifu Bay, Bouru Island, Dutch East Indies. December 10, 1909. Length, 63 mm.
10 examples. D. 5581. September 26, 1909. Length, 10–38 mm.

ANCHOVIELLA PURPUREA (Fowler)

Stolephorus purpureus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1900, p. 497, pl. 19, fig. 1 (type locality: Hawaiian Islands).—JORDAN and JORDAN, Mem. Carnegie Mus., vol. 10, p. 8, 1922 (Hawaii).

Anchovia purpurea JENKINS, Bull. U. S. Fish Comm., vol. 22, 1902, p. 432, 1904 (Honolulu).—SNYDER, Bull. U. S. Fish Comm., vol. 22, 1902, p. 521, 1904 (Honolulu).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, pt. 1, 1903, p. 60, fig. 12, 1905 (Honolulu, Hilo, Kailua).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 214 (types; Hawaiian Islands); Copeia, No. 112, p. 82, 1922 (Hawaii).

Engraulis purpureus Günther, Journ. Mus. Godeffroy, pt. 16, p. 78, 1909 (Hawaiian Islands).—Fowler, Bishop Mus., Bull. 22, p. 23, 1925 (Honolulu); Bull. 38, p. 5, 1927 (Honolulu); Mem. Bishop Mus., vol. 10, p. 33, 1928 (Honolulu, types; Hawaii; Kahului).

Depth 5 to $5\frac{3}{4}$, belly rounded; head $3\frac{1}{3}$ to $3\frac{3}{4}$, width $2\frac{4}{5}$. Snout $3\frac{2}{5}$ to 5 in head; eye $3\frac{1}{3}$ to 4, greater than snout or interorbital; maxillary not quite reaching mandible base, length $1\frac{1}{5}$ to $1\frac{2}{5}$ in head; interorbital $4\frac{1}{4}$ to $5\frac{1}{4}$, broadly convex. Gill rakers 21+21, fine, $1\frac{1}{5}$ in eye; gill filaments $\frac{1}{2}$ gill rakers.

Scales rather adherent, 38 to 41 in median lateral series to caudal base and 3 more on latter; 9 or 10 transversely, 19 to 21 predorsal. Scaly axillary flap $1\frac{1}{2}$ in pectoral. No abdominal serrae. Scales with 1 or 2 transverse or vertical striae; circuli very fine, vertically parallel.

D. iii, 10, i to iii, 12, i, first branched ray $1\frac{3}{5}$ to $1\frac{2}{3}$ in head; A. iii, 14, i or iii, 15, i, first branched ray $2\frac{1}{3}$ to $2\frac{2}{5}$; least depth of caudal peduncle $1\frac{1}{4}$ to $1\frac{2}{5}$, small, well forked, rather short and lobes pointed; pectoral $1\frac{7}{8}$ to 2; ventral $2\frac{1}{2}$ to $2\frac{3}{5}$.

Body very pale brown, under surface whitish. Scales with tinsel-like iridescent shades of violet. Broad silvery white lateral band, width equals eye on caudal peduncle.

Hawaiian Islands.

U.S.N.M. No. 51056. Hawaii. U. S. Fish Commission. Length, 55–68 mm. 5 examples.

U.S.N.M. No. 55421. Hawaii. Jordan and Evermann. 1901. Length, 65 mm.

U.S.N.M. No. 55422. Hilo, Hawaii. U. S. Fish Commission. Length, 69 mm.

U.S.N.M. No. 55426. Honolulu ? 1901. Jordan and Evermann. Length, 55–63 mm. 5 examples.

U.S.N.M. No. 55444. Honolulu. *Albatross* collection. Length, 38–76 mm. 2 examples.

A.N.S.P. Nos. 23329, 23330. Hawaiian Islands. Dr. W. H. Jones. Length, 55–88 mm. Types of *Stolephorus purpureus*.

A.N.S.P. Nos. 29428 to 29436. Kahului, Maui. Stanford University.

A.N.S.P. Nos. 28186 to 28192. Hawaiian Islands. Stanford University.

ANCHOVIELLA ZOLLINGERI (Bleeker)

Engraulis zollingeri Bleeker, Journ. Indian Arch., vol. 3, p. (69) 73, 1849 (type locality: Macassar, Celebes).—Günther, Cat. Fishes British Mus., vol. 7, p. 387, 1867 (no locality).—Weber, *Siboga* Exped., vol. 57, Fische, p. 6, 1913 (Lombok; Nusa-Laut).—Herre, Field Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 35, 1936 (Fiji).

Stolephorus (*Stolephorus*) *zollingeri* Bleeker, Nederland. Tijdschr. Dierk., vol. 3, p. 303, 1866 (Batavia, Java; Padang, Sumatra; Bali; Celebes; Amboina).

Stolephorus zollingeri Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 126, pl. (6) 266, fig. 2, 1866–72 (Java, Sumatra, Bali, Celebes, Amboina).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 44, 1913 (Lombok; Nusa-Laut).—Chevey, Inst. Océanogr. Indochine, 19^{e} note p. 8, 1932 (Cambodia; Phu-Quoc).—Hardenberg, Treubia, vol. 14, livr. 3, p. 326, fig. 8, 1934 (Ambon; Menado; Puger).

Anchovia zollingeri FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 62, 1922, p. 2 (Takao, Formosa).

Anchoviella zollingeri FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, fig. 4, 1934 (Sanoer, Bali).

Depth 5 to 6¾; head 3½ to 3¾, width 2¼ to 2½. Snout 4 to 4⅖ in head; eye 3¼ to 4, greater than snout or interorbital; maxillary reaches mandibular joint, not to hind preopercle edge, truncated behind, length 1¼ to 1⅓ in head; interorbital slightly less than eye. Gill rakers about 17+17 to 20, very fine, slender elongate, much longer than gill filaments or nearly equal eye.

Scales 35 to 37 (pockets) in medial lateral series to caudal base; (8 or 9 transversely). Scales caducous. Abdominal scutes 4 or 5 between pectorals and ventrals.

D. III, 10 to III, 12, first branched ray 1¾ to 1⅘ in head; A. III, 13 to III, 14, first branched ray 3; least depth of caudal peduncle 3⅕ to 3¼; caudal subequal with head, forked; pectoral 1⅔; ventral 2¾ to 2⅘.

Above brownish, below silvery white. Iris silvery white. Ill-defined silvery lateral band.

East Indies, Formosa, Polynesia.

6 examples. Abuyog, Leyte. July 26, 1909. Length, 35–40 mm.
2 examples. Baganga Bay. May 15, 1908. Length, 44–48 mm.
1 example. Butauanan Island. June 12, 1909. Length, 62 mm.
D. 5581. Bumbum Island (N. W.), S. 83° W., 3.5 miles (lat. 4°30′25″ N., long. 118°41′30″ E.) September 25, 1909. Length, 73–78 mm.
1 example. Cebu market. September 4, 1909. Length, 64 mm.
1 example. Maribojoc, Bohol. March 25, 1909. Length, 48 mm.
2 examples. Mati, Pujada Bay, Mindanao. May 15, 1908. Length, 37–38 mm.
14 examples. Nasugbu, Luzon. January 16, 1908. Length, 29–50 mm.
65 examples. Nasugbu. January 21, 1908. Length, 27–41 mm.
1 example. Nogas Point, Panay. February 3, 1908. Length, 48 mm.
6529, 6530. Off Daet. June 15, 1909. Length, 58–60 mm.
534 examples. Port Bais Anchorage. March 31, 1908. Length, 40–55 mm.
1 example. Port Binanga. January 8, 1908. Length, 35 mm.
70 examples. Port Dupon, Leyte. March 17, 1909. Length, 40–65 mm.
4 examples. Port Dupon. May 6, 1908. Length, 35–42 mm.
1 example. Port Jamelo. July 12, 1908. Length, 60 mm.
1 example. Romblon Harbor. March 25, 1908. Length, 65 mm.

ANCHOVIELLA HOLODON (Boulenger)

Engraulis holodon BOULENGER, Marine Invest. South Africa, vol. 1, p. 12, 1902 (type locality: Zwartkops River, Algoa Bay).—GILCHRIST, Marine Invest. South Africa, vol. 6, 1901, p. 154, 1902 (reference).—REGAN, Ann. Durban Mus., vol. 2, p. 197, 1917–20 (Durban).

Stolephorus holodon BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 117, 1925 (Delagoa Bay, Port Elizabeth, Natal).

Anchoviella holodon FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 412, 1934 (Natal; Durban; St. Lucia, North Zululand); vol. 87, p. 366, 1935 (Durban beach).

Engraulis encrasicholus (not Linnaeus) Pappe, Synops. Edible Fishes Cape of Good Hope, p. 21, 1853 (Cape of Good Hope).—Bleeker, Nat. Tijdschr. Nederland. Indiē, vol. 21, p. 56, 1860 (reference).—Castelnau, Mem. Poiss. Afrique Australe, p. 68, 1861 (Cape of Good Hope).

Stolephorus extensus Jordan and Seale, Bull. Mus. Comp. Zool., vol. 67, No. 11, p. 382, 1926 (type locality: Mauritius).

Depth 6⅕; head 4$\frac{7}{10}$. Snout 1⅕ in eye, pointed, projecting; eye 3⅖; maxillary ends at mandibular joint, tip rounded, length equals head behind eye; teeth small, distinct in jaws, on vomer, palatines, and pterygoids; opercle smooth. Lower gill rakers 27, 1⅓ in eye.

Scales about 40 in medial lateral series, caducous. Ventral profile with 2 spines between pectorals and ventrals.

D. 16, dorsal origin midway between eye center and caudal base, length equals fin base; A. 20, origin below tenth dorsal ray, base 6$\frac{1}{10}$ in standard length; caudal about equals head, forked; pectoral equals head behind eye; ventral 2½ in head, rays 7.

Light brown. Narrow silvery stripe from head to caudal, edge not very well outlined; narrow anteriorly, broadens posteriorly to pupil width. Length not given. (Jordan and Seale.)

Mauritius, South Africa. *Stolephorus extensus* seems synonymous. According to Barnard the ventral scutes 8 or 9+6 or 7 and the species reaches 70 mm. The only point at variance he gives is that the maxillary tapers to a blunt point behind and extends to edge of gill cover.

ANCHOVIELLA WAITEI (Jordan and Seale)

Stolephorus waitei Jordan and Seale, Bull. Mus. Comp. Zool., vol. 67, p. 379, 1926 [type locality: Queensland (Beddome)].

Depth 5; head 5. Snout 2 in eye, short, pointed, projecting; maxillary reaches gill opening, length equals head without snout; teeth small, distinct in jaws, on vomer, palatines, pterygoids, and hyoid; opercle smooth. Lower gill rakers 23, longest ½ of eye.

Scales 40 in medial lateral series, caducous; scales with complete striae. Ventral scutes 5 to 7 between pectorals and ventrals.

D. 14, origin midway between nostril and caudal base, longest ray subequal with or little longer than fin base; A. 19, origin below tenth dorsal ray, base 6 in standard length; caudal equals head, forked, lower lobe longer; pectoral equals head posterior of middle of eye; ventral equals space from snout tip to eye center, rays 7.

Silvery, with slight shade of light brown. Very distinctly outlined silvery lateral stripe from head to caudal, width 1½ in eye. Length, 110 mm. (Jordan and Seale.)

North Australia. Although originally said to be most nearly related to *Anchoviella indica* it surely is very close to *Anchoviella commersonii*.

ANCHOVIELLA COMMERSONII (Lacépède)

Stolephorus commersonii LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 381, 382, pl. 12, fig. 1, 1803 (no locality; on Commerson).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 148, 1874 (compiled; Amoy).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 45, fig. 19, 1913 (Batavia, Samarang, Nias, Balikpapan, Kangeang, Salibabu).—HARDENBERG, Treubia, vol. 14, livr. 3, p. 323, fig. 5, 1934 (Java; Sumatra; Borneo).—ROXAS, Philippine Journ. Sci., vol. 55, No. 3, p. 265, pl. 2, fig. 2 (scale), 1934 (Luzon; Leyte).—HARDENBERG, Treubia, vol. 15, livr. 3, p. 228, 1936 (Batu Ampar; Telok Pekadai, Borneo).—ROXAS and MARTIN, Dept. Agr. Comm. Manilla Tech. Bull. 6, p. 24, 1937 (reference).

Stolephorus commersoni CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1ᵉ note, p. 8, 1926 (Cochinchina).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped., 1931, p. 15, 1934 (Banang Sur; Dumaguete).

Anchovia commersonnii FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang, Sumatra); Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 218 (same examples).

Anchovia commersonii BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 592, 1912 (Batavia).—FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines).

Engraulis commersonii FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 258, 1927 (San Fernando; Bangued; Santa Maria; Vigan; Philippines); Journ. Bombay Nat. Hist. Soc., vol. 32, p. 704, 1928 (Colombo, Ceylon); Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 600 (1930) (Hong Kong; note).

Anchoviella commersonii FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, 1934 (Benoa; Sanoer, Bali); vol. 89, p. 131, 1937 (Bangkok; Paknam; Tachin).

Anchoviella commersonnii FOWLER, List Fish. Malaya, p. 32, 1938 (reference) (error).

Scutengraulis commersonii FOWLER, Hong Kong Nat. vol. 2, p. 200, 1931 (reference).

Stolephorus commersionianus BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 128, pl. (1) 259, fig. 1, 1866–72 (Java, Madura, Bali, Sumatra, Singapore, Bintang, Banka, Borneo, Celebes, Batjan, Amboina).

Commersonian atherine SHAW, General zoology, vol. 5, pl. 113, upper fig., 1804 (no locality).

Engraulis commersonianus GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 388, 1868 (Zanzibar; Bengal).—DAY, Fishes of India, pt. 4, p. 629, pl. 158, fig. 1, 1878 (India).—BOULENGER, Proc. Zool. Soc. London, 1887, p. 666 (Muscat).—DAY, Fauna British India, Fishes, vol. 1, p. 394, 1889.—WEBER, *Siboga* Exped., Fische, vol. 57, p. 5, 1913 (Kanglang Island, Menado, Salibabu Island).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 3, p. 356, 1929 (Travancore.)—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, p. 112, 1929 (Phuquoc, Poulo-Condore).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 21, fig. 16, 1929 (Amoy).

Anchovia commersoniana JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 771, 1905 (Negros); Bull. Bur. Fisher., vol. 26 (1906), p. 5, 1907 (Manila).

Clupea vittargentea LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 458, 1803 (type locality: Mauritius). (On Commerson.)

Engraulis brownii (not Gmelin) VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 41, 1848 (Bombay, Pondicherry, mouth of Arian-Coupang river, Batavia, Mauritius).—BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 39, 1852 (Java).—KNER, Reise *Novara*, Fische, p. 332, 1865 (Java).

Stolephorus browni Bleeker, Nederland. Tijdschr. Dierk., vol. 2, p. 57, 1865 (Amoy.)

Stolephorus (*Stolephorus*) *brownii* Bleeker, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 294, 1868 (Rio, Bintang).

? *Engraulis carpentariae* DeVis, Proc. Linn. Soc. New South Wales, vol. 7, p. 320, 1883 (type locality: Norman River, Gulf of Carpentaria).—Macleay, Proc. Linn. Soc. New South Wales, vol. 9, p. 57, 1884 (compiled).

Anchovia apiensis Jordan and Seale, Bull. Bur. Fisher., vol. 25 (1905), p. 187, fig. 3, 1906 (type locality: Apia, Samoa).

Engraulis apiensis Günther, Journ. Mus. Godeffroy, pt. 6, p. 378, 1909 (Samoa).—Fowler, Mem. Bishop Mus., vol. 10, p. 33, 1928 (type of *Anchovia apiensis*).—Herre, Field Mus. Nat. Hist. Publ. 353, zool, ser., vol. 21, p. 33, 1936 (Fiji; Samoa).

Engraulis koreanus Kishinouye, Journ. Imp. Fisher. Bur. Tokyo, vol. 14, p. 101, 1907 (type locality: Korea).

Anchovia koreana Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 167, 1909 (Takao).

Stolephorus koreanus Mori, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Ruganho, Korea).

Depth 4 to 4⅘; head 4, width 2⅕ to 2⅓. Snout 4½ to 4¾ in head; eye 3⅓ to 3¾, greater than snout or interorbital, covered with adipose membrane; maxillary reaches gill opening, expansion 2⅔ in eye, length 1 to 1⅛ in head; row of fine teeth on each maxillary and narrow bands on vomer and palatines; interorbital 3⅓ to 4, slightly convex. Gill rakers 17 to 19+21 to 23, lanceolate, greater than gill filaments or 1⅖ in eye.

Scales 33 to 35 (pockets) in median lateral series to caudal base and 3 more on latter, very caducous; 7 to 9 scales transversely, 18 to 21? predorsal. Pectoral axillary scale ⅔ of fin; ventral axillary scale ⅞ of fin. Abdominal serrae 4 to 7 denticles between pectoral and ventral bases, none on postventral. Venulose area at shoulder. Scales with 7 vertical striae; circuli very fine, as parallel transverse striae.

D. iii, 11, i to iii, 14, i, inserted little nearer caudal base than front eye edge, third simple ray 1⅗ to 1¾ in head; A. iii, 17, i to iii, 19, i, inserted opposite last ⅖ in depressed dorsal length, first branched ray 1⁹⁄₁₀ to 2 in head; least depth of caudal peduncle 2⅖ to 2⅗; pectoral 1½ to 1⅚; ventral 2 to 2½; caudal 3¾ to 3⅘ in combined head and body, forked.

Largely pale brown. Faint silvery lateral band, less than eye in width, widest on caudal peduncle. Iris gray. Dorsal and caudal gray, other fins whitish.

Arabia, Zanzibar, Mauritius, India, Ceylon, East Indies, Philippines, China, Formosa, Korea, Polynesia. Known by its maxillary reaching the gill opening and 4 to 7 abdominal denticles between the pectoral and ventral bases. Weber and Beaufort's figure shows 14 abdominal denticles before the ventral origin of which 2 anterior to the pectoral origin, besides 7 which are behind the ventral base.

I cannot see that the imperfectly described *Engraulis carpentariae* De Vis differs from the present species.

Depth 4⅔ to 5 (without caudal); head 4⅔ to 5. Snout 4 in head; eye 3; maxillary not reaching beyond gill opening; teeth in both jaws.

D. 15, orgin nearer caudal than to snout; A. 21, origin opposite middle of dorsal.

Color of skin (scales lost) orange, with rather broad silvery streak. Head pale silvery. Large black spot on each side of occiput with few black dots around it. Black dots along spine and on each interneural joint of dorsal and anal. Caudal punctuated with black, other fins white, immaculate. Length, 38 mm. (De Vis.)

53 exampes. Abuyog, Leyte. July 26, 1909. Length, 33–85 mm.

20144. Bacoor, Luzon. June 15, 1908. Length, 74 mm.

5 examples. Baganga Bay. May 5, 1908. Length, 76–108 mm.

2 examples. Batangas, Luzon. January 7, 1908. Length, 71–80 mm.

4 examples. Cavite market. June 14, 1908. Length, 93–107 mm.

5 examples. Cavite and San Roque markets. June 27, 1908. Length, 76–83 mm.

7540, 7741. Cotabato, Mindoro. May 20, 1908. Length, 100 mm.

4 examples. Dagupan, Luzon. March 19, 1908. Length, 30–60 mm.

1 example. Hinunangan beach, Leyte. July 30, 1909. Length, 38 mm.

3 examples. Iloilo market. March 28, 1908. Length, 83–95 mm.

9 examples. Iloilo market. June 1, 1908. Length, 88–105 mm.

2 examples. Luzon shore, San Vicente Harbor. November 13, 1908. Length, 40–42 mm.

13 examples. Malampaya River, Palawan. December 26, 1908. Length, 49–61 mm.

5160, 5161. Manila market. December 12 to 18, 1907. Length, 65–100 mm.

10 examples. Mantaquin Bay, Palawan. April 1, 1909. Length, 40–55 mm.

1 example. Mati, Pujada Bay. May 15, 1908. Length, 61 mm.

1 example. North end of Endeavour Strait, northwest coast of Palawan. December 22, 1908. Length, 93 mm.

2 examples. Parang, Mindanao. May 23, 1908. Length, 36–39 mm.

1 example. Port Dupon, Leyte. May 6, 1908. Length, 76 mm.

2 examples. Port Dupon, March 17, 1909. Length, 78–86 mm.

1 example. Port Jamelo, Luzon. July 13, 1908. Length, 50 mm.

1 example. Pucot River, Mariveles. January 29, 1909. Length, 92 mm.

19468, 19508. Tagay River tidewater. March 10, 1909. Length, 95–104 mm.

22328. River at Pasacao, Luzon. March 9, 1909. Length, 85 mm.

20080. River at Nakoda Bay, Palawan. December 31, 1908. Length, 80 mm.

22299. Rosa Island, Mantaquin Bay, Palawan. April 1, 1909. Length, 70 mm.

1 example. Santiago River, Pagapas Bay, Luzon. February 20, 1909. Length, 75 mm.

7 examples. Tacloban market. July 25, 1909. Length, 60–73 mm.

5 examples. Ulugan Bay, near mouth of Baheli River. December 28, 1908. Length, 36–46 mm.

7 examples. Verde del Sur Island, Palawan. April 6, 1909. Length, 80–110 mm.

73 examples. Sandakan Bay, Borneo. March 2, 1908. Length, 33–58 mm. 19987.

21 examples. Sebatic Island, Borneo. October 1909. Length, 37–64 mm.
3 examples. Sebatic Island. November 3, 1909. Length, 68–77 mm.
9 examples. Tifu Bay, Bouru Island. Length, 61–107 mm.

ANCHOVIELLA CHINENSIS (Günther)

Engraulis chinensis GÜNTHER, Rep. Voy. *Challenger*, vol. 1, p. 73, 1880 (on Günther 1868).

Engraulis japonica (not Houttuyn) GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 390, 1868 (type locality: China).

Depth 5; head 4½. Snout pointed, much projecting beyond lower jaw; maxillary very finely toothed, produced and pointed behind, extending to preopercle angle. Branchiostegals 13.

Scales 42 in medial lateral series. Abdomen compressed before ventrals with 6 scutes.

D. 17, origin nearer caudal base than end of snout; A. 22, begins below middle of dorsal.

A well-defined silvery band narrower than orbit runs along side. (Günther.)

China. Size not given.

ANCHOVIELLA INDICA (Van Hasselt)

Engraulis indica VAN HASSELT, Algemein Konst-Letterbode, p. 329, 1823 (type locality: Java).—DAY, Fishes of India, pt. 4, p. 629, pl. 158, fig. 3, 1878 (India); Fauna Brit. India, Fishes, vol. 1, p. 394, 1889.—WEBER, Zool. Nederland. Ost Ind., vol. 3, p. 427, 1894 (Tanette River mouth, Celebes).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 115, pt. 1, p. 1424, 1906 (Upolu).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 377, 1909 (Tahiti).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 5, 1913 (Labuan Tring; Siau).—FOWLER, Mem. Bishop Mus., vol. 10, p. 33, 1928 (compiled).

Engraulis indicus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1927, p. 259 (Orion; Philippines).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 356, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6e note, p. 113, 1929 (Cochinchina).

Stolephorus indicus BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 127, pl. (1)259, fig. 2, 1866–72 (Java, Sumatra, Bali, Celebes, Bawean, Pinang, Singapore, Bintang, Banka, Batjan, Ternate, Amboina).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 46, 1913 (Madura, Lombok, Nias, Macassar, Tanette).—JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, p. 379, 1926 (Java; Straits Settlements).—CHEVEY, Inst. Océanogr. Indo-chine, 19e note, p. 8, 1932 (Cambodia; Cochinchina; Annam).—HARDENBERG, Nat. Tijdschr. Ned. Indie, vol. 93, p. 263, 1933 (reference).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete).—HARDENBERG, Treubia, vol. 14, livr. 3, p. 322, fig. 4, 1934 (Java; Borneo; Sumatra; Celebes).—HERRE, Fishes Herre Philippine Exped. 1931, p. 16, 1934 (Cebu, Dumaguete; Atimonan); Mid-Pacific Mag., vol. 10, No. 2, p. 163, April–June 1935 (Pelew Islands).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 24, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 14, 1937 (Canthiburi; Songkhla; Gulf of Siam).

Stolephorus indicus indicus HARDENBERG. Nat. Tijdschr. Ned. Indie, vol. 93, p. 263, 1933 (reference).

Anchovia indica JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 328, 1902 (Formosa, Suwata).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 636, 1906 (Formosa).—JORDAN and SEALE, Bull. Bur. Fisher., vol. 26, 1906, p. 5, 1907 (Cavite).—EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26, 1906, p. 54, 1907 (Bulan).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 166, 1909 (Takao).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 592, 1912 (Batavia).—SEALE, Philippine Journ. Sci., vol. 9, p. 59, 1914 (Hong Kong).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 177, 1931 (Kominato, Riu Kiu).

Scutengraulis indica FOWLER, Hong Kong Nat., vol. 2, p. 200, 1931 (reference).

Anchoviella indica FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69 (Sanoer; Den Pasar, Bali), p. 86, 1934 (Chieng Mai?); vol. 86, p. 412, 1934 (Durban); Ann. Natal Mus., vol. 7, p. 404, text-fig. 1, 1934 (Durban); Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 131, 1937 (Bangkok; Paknam); List Fish. Malaya, p. 32, 247, 1938 (reference).

Engraulis albus SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, p. 293, 1839 (on *Nattoo* Russell, Fishes of Coromandel, vol. 2, p. 71, pl. 187, 1803, type locality: Vizagapatam).

Engraulis brownii (not Gmelin) CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1285, 1849 (Malay Peninsula and islands).—BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 64, 1861 (Pinang).—DAY, Fishes of Malabar, p. 237, 1865.—GÜNTHER, Fishes of Zanzibar, p. 123, 1866 (Zanzibar).

Engraulis baliensis BLEEKER, Verh. Batav. Genootsch. (Bali), vol. 22, p. 11, 1849 (type locality: Boleling, Bali).

Anchovia baliensis FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 62, p. 2, 1922 (Takao, Formosa).

Engraulis russellii BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 38, 1852 (type locality: Batavia, Samarang; Boleling, Bali).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 390, 1868 (Amboina; Malay Peninsula).—DÜNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 185, 1904 (Singapore).

Stolephorus russeli BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 236, 1863 (reference; Ternate).

Engraulis samam inan THIOLLIÈRE, Fauna Woodlark, p. 208, 1857 (type locality: Woodlark Island).

Engraulis encrasicholus (not Linnaeus) GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 158, 1874 (Chefoo).

Anchovia commersonii (not Lacépède) FOWLER, Copeia, No. 58, p. 62, 1918 (part; Philippines).

Stolephorus insularum JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, p. 381, 1926 (Tahiti).

Stolephorus indicus nanus HARDENBERG, Nat. Tijdschr. Ned. Indie, vol. 93, p. 263, 1933 (type locality, no locality given).

Depth 5 to 5½; head 3½ to 4½, width 2¼ to 2⅔. Snout 3⅞ to 4½ in head; eye 3¼ to 3¾, greater than snout or interorbital; maxillary reaches hind preopercle edge or but slightly beyond, length 1⅓ to 1⅖ in head; interorbital 3½ to 4¼, low, nearly level. Gill rakers 20+21 or 22, slender, lanceolate, little longer than gill filaments or 1¾ in eye.

Scales 35 to 37 (pockets) in median lateral series to caudal base; 8 to 10 transversely, 20 to 22 predorsal. Abdominal scutes 5 between pectorals and ventrals. Scales with 5 to 7 transverse vertical striae; circuli as very fine parallel vertical striae.

D. III, 13, first branched ray 1$\frac{3}{5}$ to 1$\frac{4}{5}$ in head; A. II or III, 16 or 17, first branched ray 2 to 2$\frac{1}{4}$; caudal 1$\frac{1}{5}$ to 1$\frac{1}{4}$, deeply forked, rather short lobes obtusely pointed; least depth of caudal peduncle 2$\frac{2}{3}$ to 3; pectoral 1$\frac{2}{3}$ to 1$\frac{3}{4}$; ventral 3 to 3$\frac{1}{8}$.

Pale brownish. Head laterally with silvery white. Brown blotch on top of head. Broad silvery white band, little wider than pupil though little less than eye, from shoulder to caudal base medianly, greatest expansion opposite dorsal. Iris yellowish white. Dorsal and caudal grayish, other fins pale brownish.

Zanzibar, India, Malay Peninsula, Pinang, Singapore, East Indies, Philippines, China, Formosa, Melanesia, Polynesia. I cannot help thinking *Stolephorus insularum* is the present species. It is said to show: Depth 6$\frac{9}{10}$; maxillary not extending posterior to mandible, tip truncate; lower gill rakers 28; 2 ventral spines between pectorals and ventrals; length 75 to 92 mm.

4 examples. Balamban, Cebu. April 2, 1908. Length, 35–38 mm.
20 examples. Busin Harbor, Burias Island. April 22, 1908. Length, 20–37 mm.
5955. Cavite market. December 1, 1908. Length, 91 mm.
6251, 6252. Cebu market. August 29, 1909. Length, 91 mm.
D. 5176. Escarceo Light, S. 57° E., 7 miles (lat. 13°35′15″ N., long. 120°53′20″ E.), Verde Island Passage. March 24, 1908. Length, 19–29 mm. 6 examples.
D. 5532. Gigantangan Island (S.), S. 33° E., 3.8 miles (lat. 11°36′39″ N., long. 124°13′30″ E.), between Masbate and Leyte. August 13, 1909. Length, 20 mm.
20517, 20518. Guijulugan shore. April 2, 1909. Length, 106–110 mm.
4 examples. Hinunangan beach, Leyte. July 3, 1909. Length, 35–41 mm.
2 examples. Iloilo market, Panay. March 28, 1908. Length, 92–118 mm.
5 examples. Iloilo market. June 1, 1908. Length, 94–124 mm.
20159, 20160. Manila Bay. December 9, 1907. Length, 97–104 mm.
5158, 5159. Manila market. December 12 to 18, 1907. Length, 90–96 mm.
20 examples. Mantaquin Bay, Palawan. April 1, 1909. Length, 35–65 mm.
2 examples. Mati, Pujada Bay. May 15, 1908. Length, 43–77 mm.
1 example. Nato, Luzon. June 19, 1909. Length, 106 mm.
5 examples. Olongapo. January 7, 1908. Length, 22–35 mm.
10 examples. Panabutan Bay, Mindanao. February 5, 1908. Length, 33–55 mm.
2 examples. Port Jamelo, Luzon. July 13, 1908. Length, 50 mm.
18 examples. Port San Vicente. November 18, 1908. Length, 23–48 mm.
4 examples. Santa Cruz, Marinduque. April 24, 1908. Length, 41 or 42 mm.
14 examples. San Vincent Harbor, Luzon shore. November 13, 1908. Length, 28–43 mm.
1 example. Shore above Iloilo River, Panay. June 2, 1908. Length, 28 mm.
1 example. Taal anchorage, East Luzon. February 20, 1909. Length, 31 mm.
3 examples. Kowloon market, China. October 5, 1908. Length, 127 or 128 mm.

ANCHOVIELLA BATAVIENSIS (Hardenberg)

Stolephorus insularis bataviensis HARDENBERG, Nat. Tijdschr. Ned. Indie, vol. 93, p. 261, 1933 (type locality: Batavia).

Stolephorus insularis (not Jordan and Seale, 1926) HARDENBERG, Nat. Tijdschr. Ned. Indie, vol. 93, p. 260, 1933 (type locality, along the Java coast; Moluccas); Treubia, vol. 14, livr. 3, p. 321, fig. 3, 1934 (Java; Sumatra; Borneo; Celebes; Singapore).

Stolephorus insularis insularis HARDENBERG, Nat. Tijdschr. Ned. Indie, vol. 93, p. 261, 1933 (reference).

Stolephorus insularis baweanensis HARDENBERG, Nat. Tijdschr. Ned. Indie, vol. 93, p. 261, 1933 (type locality: Bawean, Java Sea).

Stolephorus insularis oceanicus HARDENBERG, Nat. Tijdschr. Ned. Indie, vol. 93, p. 261, 1933 (type locality: South coast of Java).

Depth 4 to 4½; head 3⅘ to 4⅓. Snout ¾ of eye; eye 3¹⁄₁₀ to 3⅗ in head; maxillary reaches to gill opening, dilated above mandibulary joint, pointed. Lower gill rakers 20 to 26.

Scales 37 or 38 in lateral series; 9 or 10 transversely. Scales deciduous, scarcely striated. Abdominal scutes 4 to 7, spiny, last some distance before ventral. Vertebrae 39 to 41, of which 19 or 20 caudal.

D. 16 or 17, origin somewhat behind middle between snout tip and first rays of caudal; A. 20 to 23, origin midway between mandibulary joint or gill opening and caudal base, below dorsal, fin long as head without snout, 4⁹⁄₁₀ to 5⅓ in length; pectoral not reaching ventral, long as or longer than postorbital part of head, rays 12 to 14; ventrals ⅔ of pectoral, inserted before dorsal or in middle between anal origin and pectoral base, rays 7.

A silvery lateral band from head to caudal. Black spot on occiput. Back somewhat pigmented. Fins hyaline, caudal powdered with black.

Length, mature at 60 mm., reaches 110 mm. (Hardenberg.)

Java, Bawean, Moluccas, especially near islands at some distance from the coast. The various forms named by Hardenberg are based on slight differences in the averages for the counts of the vertebrae, and the pigmentation.

ANCHOVIELLA TRI (Bleeker)

Engraulis tri BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, 1852, p. 40, 1852 (type locality: Batavia).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 389, 1868 (type).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 148, 1874 (name).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 404, 1876 (Batjan; Manila).—DAY, Fishes of India, pt. 4, p. 630, pl. 158, fig. 6, 1878 (Calcutta, India, Bombay); Fauna British India, Fishes, vol. 1, p. 395, 1889.—ELERA, Cat. Fauna Filip., vol. 1, p. 579, 1895 (Luzon; Manila).—DÜNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 185, 1904 (Kuala Langat; Kuala Salanga, Muar River).—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 32, p. 254, 1927 (Bombay); Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 259, 1927 (Santa Maria, Orani, Orion, Philippines).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 113, 174, 1929 (Saigon, Thudaumot, Cochinchina).—HERRE, Field Mus. Nat. Hist. Publ. 353, zool. ser., vol. 21, p. 35, 1936 (New Hebrides).

Stolephorus tri Bleeker, Nederland. Tijdschr. Dierk., vol. 2, p. 57, 1865 (Amoy); Atlas Ichth. Ind. Néerland., vol. 6, p. 128, 1866–72 (Java; Banka; Borneo).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 47, 1913 (Bagan Api Api, Sumatra).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 622, 1926 (Sarawak).—Hardenberg, Treubia, vol. 13 livr. 1, p. 106, 1931 (Bagan Si Api Api).—Chevey, Inst. Océanogr. Indochine, 19^e note, p. 9, 1932 (Cochinchina; Cambodia).—Herre, Fishes Herre Philippine Exped., 1931, p. 16, 1934 (Bauang Sur; Manila; Cotabato).—Roxas, Philippine Journ. Sci., vol. 55, p. 268, pl. 2, fig. 14, 1934 (Luzon; Samar; Guimaras).—Hardenberg, Treubia, vol. 14, livr. 3, p. 318, fig. 1, 1934 (Java; Sumatra; Borneo).—Herre, Mid-Pacific Mag. vol. 10, No. 2, p. 163, April–June 1935 (Pelew Islands).—Hardenberg, Treubia, vol. 15, livr. 3, p. 228, 1936 (Telok, Pekadai, Borneo).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 24, 1937 (reference).

Stolephorus (*Thrissa*) *tri* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, pl. (4) 262, fig. 1, 1866–72.

Scutengraulis tri Fowler, Hong Kong Nat., vol. 2, p. 201, 1931 (reference).

Anchoviella tri Fowler, List Fish. Malaya, p. 33, 1938 (reference).

Anchovia commersonii (not Lacépède) Fowler, Copeia, No. 58, p. 62, 1918 (part; Philippines).

Stolephorus rex Jordan and Seale, Bull. Mus. Comp. Zool., vol. 67, p. 380, 1926 (type locality: Canara, India).

Depth 4⅓ to 4½; head 4 to 4⅖, width 2¼ to 2⅖. Snout 5 to 5⅛ in head; eye 3⅖ to 3⅔, greater than snout, equals interorbital; maxillary variably not quite to hind preopercle edge, usually not to gill opening, length 1⅒ to 1⅙ in head; interorbital 3¼ to 3⅘, very slightly convex. Gill rakers 15+25, finely lanceolate, twice gill filaments or equal eye.

Scales 28 to 30 (pockets) in medial lateral series to caudal base and 2 or 3 more on latter; 9 transversely, 18 or 19 predorsal. Scales very deciduous, all fallen. Scales with 4 or 5 vertical striae, 10 or 11 reticulated marginally; circuli fine. Abdominal scutes 3 to 6 between pectoral and ventral.

D. iii, 12 or iii, 13, first branched ray 1⅓ to 1⅖ in head; A. iii, 15 to iii, 17, first branched ray 1⅖ to 1⅗, fin length less than 5 in entire length of fish; least depth of caudal peduncle 2⅙ to 2½; pectoral 1⅖ to 1½; ventral 2 to 2⅛; caudal 3⅞ to 4 in combined head and body.

Faded pale brownish. Iris light slate. Cluster of dusky dots on top of head posteriorly, row along dorsal base, edges of caudal peduncle and anal base. Indistinct diffuse whitish median lateral band from humeral region above to caudal base medially, widest along sides of caudal peduncle though greatest width not greater than eye. Fins all pale or whitish. Caudal grayish terminally.

India, Malay Peninsula, East Indies, Philippines.

44 examples. Abuyog, Leyte. July 26, 1909. Length, 33–88 mm. One with 3 lernean parasites protruding from thorax.

ANCHOVIELLA BAGANENSIS (Hardenberg)

Stolephorus baganensis Hardenberg, Treubia, vol. 13, livr. 1, p. 107, 1931 (Bagan Si Api Api fisheries; no description); Nat. Tijdschr. Ned. Indie, vol. 93, p. 258, 1933 (type locality: Bagan Si Api Api, Sumatra; Borneo; Java); Treubia, vol. 14, livr. 3, p. 319, fig. 2, 1934 (Java; Sumatra; Borneo).

Stolephorus baganensis baganensis Hardenberg, Treubia, vol. 14, livr. 3, p. 260, 1934 (reference).

Stolephorus baganensis macrops Hardenberg, Nat. Tijdschr. Ned. Indie, vol. 93, pt. 2, p. 260, 1933 (type locality: Indragiri River mouth, Sumatra).

Depth $3\frac{7}{10}$ to 4; head $4\frac{1}{10}$ to $4\frac{2}{5}$. Snout 2 in eye or less; eye $3\frac{1}{5}$ to $3\frac{3}{5}$ in head; maxillary reaches gill opening, dilated above mandibulary joint, pointed. Lower gill rakers 20 to 29, according to localities.

Scales 35 to 37 in lateral series; 8 or 9 transversely. Scales not deciduous, striated, in middle finely broken. Abdominal scutes 5 to 8, last one inserted before ventrals. Vertebrae 38 or 39, of which 19 or 20 caudal.

D. I, 14 to 16, origin somewhat behind middle between snout tip and first caudal rays, small spine in front of fin; A. 19 to 21, long as head or somewhat shorter, $4\frac{2}{5}$ to $4\frac{3}{5}$ in length, its origin below dorsal, midway between middle of opercle and base of caudal; pectoral rays 12 to 14, reach to middle of pupil; ventral rays 7, $\frac{2}{3}$ of pectoral, inserted before dorsal, midway between anal origin and base of pectoral.

A silvery lateral band. Black spot on occiput. Two thin lines of small pigment spots on back, from dorsal to caudal. Sides of back somewhat pigmented. Fins hyaline. Caudal bordered with black.

Length, mature at 70 mm., reaches 110 mm. (Hardenberg.)

Borneo, Sumatra, and Java, chiefly in estuaries. Closely related to *Anchoviella tri*, from which it is distinguished by the incomplete pigment lines on the back, running from the dorsal to the caudal only. In *A. tri* they extend from the head to the caudal. The saltwater *Stolephorus baganensis macrops* differs in a larger pupil and shorter anal fin or its length 5 to $5\frac{1}{2}$ in fish ($4\frac{1}{2}$ in *S. baganensis*).

ANCHOVIELLA NASUTA (Castelnau)

Engraulis nasutus Castelnau, Proc. Linn. Soc. New South Wales, vol. 3, pt. 1, p. 51, 1878 (type locality: Norman River, Gulf of Carpentaria).—Macleay, Proc. Linn. Soc. New South Wales, vol. 4, p. 367, 1880 (copied); vol. 6, p. 257, 1881 (reference).—DeVis, Proc. Linn. Soc. New South Wales, vol. 7, p. 319, 1882 (Brisbane River).

Anchoviella nasutus McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).

Depth rather over 3 without caudal; head $4\frac{1}{2}$. Snout obtuse, produced, projects considerably beyond lower jaw; teeth very fine in both jaws; maxillary well prolonged; strong longitudinal ridge on upper surface of head. Abdomen compressed, entirely spiny.

D. 12, origin midway in body without caudal; A. 32, extends well behind dorsal; caudal strongly forked.

Silvery, upper parts light brown. Fins yellow. Length 175 mm. (Castelnau.)

North Australia, Queensland.

ANCHOVIELLA AESTUARIA (Ogilby)

Anchovia aestuaria OGILBY, Proc. Roy. Soc. Queensland, vol. 23, p. 4, 1911 (type locality: Brisbane River, Queensland); Commerc. Fish. Fisher. Queensland, p. 47, 1915 (Brisbane).

Anchoviella aestuaria MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 133, 1925 (reference).

Depth 3½; head 3¾. Snout 4⅖ in head, vertically rounded in front extends before lower jaw space ¾ of eye; eye 4; maxillary reaches slightly beyond mandibular articulation; jaws with series of minute teeth, tongue toothed; interorbital 4 in head. Lower gill rakers 24, longest 1¼ in eye.

Scales 40 or 41 in medial lateral row; 9 or 10 transversely. Scales thin, easily detached. Ventral profile cultrate, rather strongly serrated.

D. 13 or 14, origin little behind ventral, height 1⅖ in head; A. 31 to 34, height 1⅖ in dorsal height; caudal peduncle depth 2⅖; pectoral 1¼; ventral 2⅓.

Pale green above, sides and below silvery. Usually dusky shoulder spot. Longer dorsal rays and caudal lobes narrowly tipped with blackish. Length, 150 mm. (Ogilby).

Queensland.

Genus COILIA Gray

Coilia GRAY, Zool. Misc., p. 9, 1831. (Type, *Coilia hamiltonii* Gray, monotypic.)

Collia SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pts. 10–15, p. 243, 1846. (Type, *Coilia hamiltonii* Gray.)

Mystus (not Gronow 1763, Klein 1775, Scopoli 1777) LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 406, 1803. (Type, *Mystus clupeoides* Lacépède=*Clupea mystus* Linnaeus, monotypic.)

Choetomus MCCLELLAND, Calcutta Journ. Nat. Hist., vol. 4, p. 405, 1843. (Type, *Choetomus playfairii* MCCULLOCH, monotypic.)

Leptonurus BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 14, 1849. (Type, *Leptonurus chrysostigma* Bleeker.)

Demicoilia JORDAN and SEALE, Copeia, No. 141, p. 28, 1925. (Type, *Coilia quadragesimalis* Valenciennes, orthotypic.)

Body compressed, very elongate, narrowing behind in long slender tail. Mouth oblique. Maxillary more or less extended. Teeth in jaws, on vomer, palatines, pterygoids and tongue; no canines. Lower gill rakers 20 to 30. Dorsal origin before that of anal. Anal rays

35 to 116. Caudal forked, unequally united with anal. Pectoral with 4 to 19 upper rays free, filamentous and much prolonged.

ANALYSIS OF SPECIES

a^1. COILIA. Maxillary not reaching beyond gill opening in adult.

  b^1. Free pectoral filaments 4 to 6.

    c^1. Anal rays 35 to 42; abdominal serrae 5 to 8--------- quadragesimalis

    c^2. Anal rays 75 to 116.

      d^1. Abdominal serrae 4 to 6+6 to 8; A. 80 to 116----------- dussumieri

      d^2. Abdominal serrae 5+10 or 11.

        e^1. Ventral rays 7-- cantoris

        e^2. Ventral rays 12--------------------------------------- ramcarati

      d^3. Abdominal serrae 17+35; A. 92------------------------- rendahli

  b^2. Free pectoral filaments 10; abdominal serrae 13 or 14+9 or 10-- coomansi

  b^3. Free pectoral filaments 11 to 14; abdominal scutes 4+7.

      f^1. Belly rounded before ventral; eye $5\frac{1}{2}$; 11 free pectoral filaments. polyfilis

      f^2. Belly with 4 scutes before ventral; eye $3\frac{1}{2}$ to 4 or more; 12 to 14 free pectoral filaments.

        g^1. A. 82 to 87------------------------------------ borneensis

        g^2. A. 116-- reynaldi

  b^4. Free pectoral filaments 19; abdominal serrae 2 or 3+9 or 10-- rebentischii

a^2. CHOETOMUS. Maxillary extends back beyond head with age (may be shorter than head in young).

      h^1. Lower gill rakers 22+24.

        i^1. Scales 70 to 75; abdominal serrae 18 or 19+32 or 33; A. 70 to 105-- mystus

        i^2. Scales 58 to 62; abdominal serrae 12 or 13+27 to 30; A. 60 to 73--------------------------------- macrognathos

      h^2. Lower gill rakers 28 to 34.

        j^1. Scales 58 to 62; abdominal serrae 15 to 17+23 to 28; A. 82 to 92; 7 free pectoral filaments---------- grayii

        j^2. Scales 50; abdominal serrae 12+19; A. 76 or 77; 6 free pectoral filaments------------------------ lindmanni

Subgenus COILIA Gray

COILIA QUADRAGESIMALIS Valenciennes

Coilia quadragesimalis VALENCIENNES, Hist. Nat. Poiss., vol. 22, p. 83, 1848 (type locality: Ganges River).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 74, 1853 (reference).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 404, 1868 (compiled).—DAY, Fishes of India, pt. 4, p. 631, 1878 (Ganges River); Fauna British India, Fishes, vol. 1, p. 397, 1889.

Demicoilia margaritifera JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, p. 363, 1926 (type locality: Colombo, Ceylon).

Depth $3\frac{1}{3}$; head $3\frac{7}{10}$. Snout 5 in head; eye $4\frac{1}{5}$; maxillary nearly or quite reaches gill opening, long as head behind nostrils; teeth small in jaws, on palatines, pterygoids, and hyoids, probably deciduous on vomer; opercle with 4 or 5 radiating grooves. Lower gill rakers 23, $1\frac{1}{10}$ in eye.

Scales 35 (pockets) in medial lateral series, caducous. Abdominal scutes 5+8, none before pectoral.

D. I, 13, origin midway between snout tip and caudal base, fin base 2½ in head; A. 35, origin behind last dorsal ray space equal to eye diameter; caudal longer than head; pectoral reaches beyond ventrals; ventral rays 7, origin slightly before dorsal, length 2⅔ in head.

Silvery, brownish on sides and back. Two rows of pearl-colored spots below median line, extend from head to caudal; upper row of 18 or 19, lower row of 16 to 18, some of which golden yellow. On sides of belly below third irregular row of 8 or 9 spots; also 4 or 5 on thorax and 5 on lower jaw. Length, 97 mm. (Jordan and Seale.)

India, Ceylon. The species originally known from an example 150 mm. long with D. 15; A. 42; pectoral rays 12, 6 upper equal half total length.

COILIA DUSSUMIERI Valenciennes

Coilia dussumieri Valenciennes, Hist. Nat. Poiss., vol. 21, p. 81, pl. 610, 1848 (type locality: Bombay, Mahé, Pondicherry).—Bleeker, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 45, 1852 (Soerabaja; Kammal); (Bengal), vol. 25, p. 74, 1853.—Day, Fishes of Malabar, p. 242, 1865.—Günther, Cat. Fishes British Mus., vol. 7, p. 403, 1868 (East Indies).—Day, Fishes of India, pt. 4, p. 631, pl. 158, fig. 8, 1878 (Bombay, Orissa); Fauna British India, Fishes, vol. 1, p. 397, fig. 122, 1889.—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 50, fig. 20, 1913 (Surabaja; Bagan Api Api).—Hora, Mem. Asiatic Soc. Bengal, vol. 6, p. 482, 1924 (Singora).—Jordan and Seale, Bull. Mus. Comp. Zool., vol. 67, p. 360, 1926 (Singapore).—Chabanaud, Service Océanogr. Pêches Indo-Chine, 1ᵉ note, p. 8, 1926 (Cochinchina).—Fowler, Journ. Bombay Soc. Nat. Hist., vol. 32, p. 254, 1927 (Bombay).—Tirant, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 115, 174, 1929 (Saigon).—Hardenberg, Treubia, vol. 13, livr. 1, p. 108, 1931 (Bagan Si Api Api).—Fowler, List Fish. Malaya, p. 33, 1938 (reference).

Coilia (*Coilia*) *dussumieri* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 140, pl. (12) 270, fig. 3, 1866–72 (Java, Madura, Singapore, Banka).

Coila dussumieri Suvatti, Index Fish. Siam, p. 16, 1937 (reference) (error).

Coilia dussumierii Hardenberg, Treubia, vol. 15, livr. 3, p. 228, 1936 (Sungei Terentang, Borneo).

Engraulis dussumieri Kner, Reise *Novara*, Fische, p. 333, 1865 (Java).

Leptonurus chrysostigma Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 14, 1849 (type locality: Madura Straits near Kammal and Surabaja).

Coilia quadrifilis Günther, Cat. Fishes British Mus., vol. 7, p. 403, 1868 (type locality: Pinang, Malayan Penin., Singapore).—Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 60, p. 571, 1870 (Singapore).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 404, 1876 (Sinkawang, Borneo).—Weber and Beaufort, Fishes Indo-Australian Archip., vol. 2, p. 51, 1913 (compiled).—Fowler, List Fish. Malaya, p. 33 (247), 1938 (reference).

Coilia (*Coilia*) *quadrifilis* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 141, 1866–72 (copied).

Coilia reynaldi (not Valenciennes) Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1292, 1849 (Pinang, Malay Peninsula, Singapore, Rangoon).—Bleeker, Verh. Batav. Genootsch. (Bengal.), vol. 25, p. (74) 148, 1853 (Calcutta).—Day, Fishes of Malabar, p. 241, 1865.—Bleeker, Versl. Med. Akad. Wet. Amsterdam, vol. 12, p. 79, 1861 (Pinang).

Coilia reijnaldi Bleeker, Verh. Batav. Genootsch., vol. 26, pl. 5, fig. 3, 1857.

Depth $4\frac{1}{3}$ to $5\frac{1}{5}$; head $4\frac{2}{3}$ to $5\frac{4}{5}$, width $2\frac{1}{6}$ to $2\frac{1}{3}$. Snout $4\frac{2}{5}$ to $5\frac{1}{8}$ in head; eye $4\frac{1}{10}$ to $4\frac{1}{2}$, greater than snout, $1\frac{2}{5}$ to $1\frac{1}{2}$ in interorbital, without lids; maxillary reaches nearly or quite to edge of gill opening, expansion 2 to $2\frac{1}{5}$ in eye, length $1\frac{1}{6}$ to $1\frac{1}{4}$ in head; interorbital $3\frac{1}{8}$ to $3\frac{1}{3}$, broadly convex, cavernous. Gill rakers 20+23, lanceolate, slender, $1\frac{1}{8}$ in eye.

Scales 65 to 70 in medial lateral series; 10 or 11 transversely, 11 or 12 predorsal to occiput. Scales rather thin, cycloid, caducous; with 5 or 6 largely radiating basal striae; rest of scale with large, open reticulations, most distinct apically. Abdominal scutes 5 or 6+6 to 8, begin behind pectoral base.

D. iii, 10 to iii, 12, with spine before dorsal, first branched ray $1\frac{1}{5}$ to $1\frac{1}{4}$ in head; A. iii, 98 to iii, 103, first branched ray $3\frac{1}{3}$ to $3\frac{2}{5}$; caudal $1\frac{1}{2}$ to $1\frac{2}{3}$, pointed; pectoral rays 8 to 11, free filaments 4 to 6 even on same fish, reach nearly or halfway to caudal base; ventral $2\frac{1}{3}$ to $2\frac{2}{3}$ in head, inserted opposite dorsal origin.

Faded largely very pale brownish, lighter below, evidently with silvery reflections in life. Fins pale, gray on anal posteriorly and on caudal. Iris slaty. Head with some brownish dots above.

Seychelles, India, Pinang, Malay Peninsula, Singapore, East Indies.

5 examples. A. N. S. P. Bombay. Dr. F. Hallberg. 1925. Length, 160–178 mm.

COILIA CANTORIS Bleeker

Coilia cantoris Bleeker, Verh. Batav. Genootsch. (Bengal.), vol. 25, p. (74) 148, 1853 (type locality: Calcutta); vol. 26, pl. 6, fig. 2, 1857.—Günther, Cat. Fishes British Mus., vol. 7, p. 402, 1868 (type).—Day, Fishes of India, pt. 4, p. 631, 1878 (type); Fauna Brit. India, Fishes, vol. 1, p. 396, 1889.

Depth $6\frac{1}{3}$ in total length; head 6. Snout pointed, projects beyond mouth; eye $4\frac{1}{2}$ in head, $1\frac{1}{2}$ in snout; maxillary not reaching gill opening, obliquely truncate; teeth in jaws small, equal.

Scales 58 in medial lateral series; abdominal scutes 5+10.

D. i–iii, 10, origin in second fourth of body length; A. 75, base rather over half total length; caudal rays 10; pectoral rays 6+6, short, free ones not reaching anal; ventral rays 7, not half long as head.

Color without marks. Length 100 mm. (Day.)

India.

COILIA RAMCARATI (Buchanan-Hamilton)

Mystus ramcarati BUCHANAN-HAMILTON, Fishes of Ganges, p. 233, 1822 (type locality: Saltwater Ganges estuaries).—MCCLELLAND, Calcutta Journ. Nat. Hist., vol. 4, p. 406, 1844.

Mystus ramcarate BUCHANAN-HAMILTON, Fishes of Ganges, p. 382, 1822 (reference).

Coilia ramcarati GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 402, 1868 (type, Calcutta, India).—DAY, Fishes of India, pt. 4, p. 631, pl. 159, fig. 2, 1878 (Bengal); Fauna British India, Fishes, vol. 1, p. 396, 1889.—LLOYD, Rec. Indian Mus., vol. 1, p. 221, 1907 (Akyab).

Engraulis (*Coilia*) *hamiltonii* GRAY, Illustr. Indian Zool. Hardwicke, vol. 1, pl. 10, fig. 3, 1830 (no locality).

Coilia hamiltonii GRAY, Zool. Misc. p. 9, 1831 (reference).—BLEEKER, Verhand. Batavia, Genoot. (Bengal), vol. 25, p. 74, 1853 (reference).

Coilia hamiltoni VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 79, 1848 (Ganges River).

Trichosoma hamiltonii SWAINSON, Nat. Hist. Animals, vol. 2, p. 292, 1839 (on Gray).

Depth 5¼ in total length; head 6. Snout ¾ of eye; eye 5 in head, greater than interorbital; maxillary reaches mandibular joint; teeth fine, rather wide set in jaws, also on palate; interorbital equals 1½ eye diameters. Lower gill rakers 28.

Scales 70 in medial lateral series; 9 or 10 transversely. Abdominal scutes 5+10 or 11.

D. I-II, 12; A. 95 to 110, base 3 in space from gill opening to caudal base; pectoral rays 12, 6 upper free and reach middle in total length; ventral rays 12, long as postorbital part of head, inserted slightly before front dorsal edge.

Generally golden, with darkish stain behind gill opening. Last half of anal and whole of caudal blackish. No golden spots on body. (Day.)

India.

COILIA RENDAHLI Jordan and Seale

Coilia rendahli JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, p. 362, 1926 (type locality: Shanghai, China).

Depth 6½; head 6⅕. Snout produced, sharp pointed; eye 4½ in head, equals snout, eyelid imperforated; maxillary reaches gill opening, somewhat expanded at mandibular joint, tip pointed; teeth in jaws, on vomer, palatines and pterygoids and posterior maxillary largest; opercle with fine radiating striae. Lower gill rakers 24, 1⅓ in eye.

Scales 75 (pockets) in medial lateral series, caducous. Abdominal scutes 17+35, some before pectoral.

D. I-14, origin midway between snout tip and fifteenth anal ray base, longest ray more than base or equals head without snout; A. 92, origin behind last dorsal ray by space equal to head, joined with caudal; caudal pointed, equals head posterior to nostrils; 6 filaments reach posterior to anal origin, longest 3 in standard length; ventral rays 7, length $2\frac{1}{10}$ in head.

Color silvery, without spots, somewhat brownish above. No silvery lateral stripe. Length, 250 mm. (Jordan and Seale.)

China.

COILIA COOMANSI Hardenberg

Coilia coomansi HARDENBERG, Treubia, vol. 14, livr. 3, p. 294, 1934 (type locality: Lower course of the Kapuas River, western Borneo); vol. 15, livr. 3, p. 228, 1936 (Peniti River; Pontianak; Telok Pekadai, Borneo).

Depth 5, dorsal profile straight from snout to dorsal and straight from dorsal to caudal, the two lines forming very blunt angle below dorsal; head 5. Snout prominent, somewhat shorter than eye; maxillary pointed, reaching to end of preopercle. Lower gill rakers 33, more than twice long as branchial filaments.

Scales 60 in lateral series; 10 transversely. Abdominal scutes 13 or 14+9 or 10.

D. I, III, 15, predorsal length to snout tip about twice in length of anal; A. 90; pectoral rays 18, about long as eye and snout, and with 10 free rays reaching beyond anal origin; ventral rays 6 or 7, inserted just before dorsal origin, somewhat shorter than postocular part of head.

Yellowish with a golden hue. Back pigmented. Dorsal somewhat blackish, other fins hyaline.

Length, 130 mm. (Hardenberg.)

East Indies.

COILIA POLYFILIS Volz

Coilia polyfilis VOLZ, Zool. Anz., vol. 26, p. 559, 1903 (type locality: Banju asin, Sumatra); Zool. Jahrb., Abth. syst., vol. 19, p. 408, 1904 (type).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 52, 1913 (compiled).

Depth 5 in total; head 5. Eye 5½ in head; maxillary reaches gill opening, expanded behind between penultimate and last fifth its length, then tapers rapidly. Lower gill rakers 28, long as eye.

Scales ? Preventral rounded, postventral sharp.

D. 13, space between origin and snout tip 4 times in total length; pectoral with 11 free rays, reaching anal origin. Length, 110 mm. (Volz.)

Sumatra.

COILIA BORNEENSIS Bleeker

Coilia borneensis BLEEKER, Nat. Tijds. Nederland. Indië, vol. 2, p. 58, 1851 (type locality: Bandjermassing); vol. 20, p. 102, 1859–60 (Bangkok); Versl. Meded. Akad. Wet. Amsterdam, vol. 16, p. 353, 1864 (Bangkok); Nederland. Tijdschr. Dierk., vol. 2, p. 176, 1865 (Siam).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 403, 1868 (type).—DAY, Fishes of India, pt. 4, p. 632, pl. 159, fig. 1, 1878 (Madras; Burma); Fauna British India, Fishes, vol. 1, p. 398, 1889.—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 9, p. 352, 1890 (Rangoon).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 52, 1913 (Bleeker's types).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6e note, pp. 30, 115, 174, 1929 (Hué).—CHEVEY, Inst. Océanogr. Indochine, 19e note, p. 9, 1932 (Cochinchina; Cambodia).—HARDENBERG, Treubia, vol. 15, livr. 3, p. 228, 1936 (Padang Tikarbay; Peniti River, Borneo).

Coilia (*Coilia*) *borneensis* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 139, pl. (12) 270, fig. 3, 1866–72 (Sumatra; Borneo).

Coila borncensis SUVATTI, Index Fish. Siam, p. 16, 1937 (reference) (error).

Depth over 4 to 5; head 4⅔ to 5. Snout prominent, shorter than eye; eye 3½ to 4 or more; maxillary extends nearly to gill opening. Lower gill rakers 26 to 28, long as eye.

Scales 52 to 60 in medial lateral series; 10 or 11 transversely. Abdominal scutes 7+4, none of preventral before pectoral.

D. I, 13 or 14, about twice as near snout as caudal base; A. 82 to 87, 1⅔ to 1⅗ in body length; pectoral rays 18 to 22, with 12 to 14 upper produced, reaching first anal rays or much farther; ventral rays 7, inserted before dorsal origin. (Weber and Beaufort.)

Above golden green or yellowish green, below yellowish silvery. Iris yellow. Fins yellowish, verticals more or less dusted dusky.

Length, 140 mm. (Bleeker.)

India, Burma, Siam, East Indies.

COILIA REYNALDI Valenciennes

Coilia reynaldi VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 81, 1848 (type locality: Irawaddy River, Rangoon, Burma).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1292, 1849 (part).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 148, 1853 (reference).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 402, 1868 (compiled).—DAY, Fishes of India, pt. 4, p. 630, 1878 (Calcutta); Fauna British India, Fishes, vol. 1, p. 396, 1889.—FOWLER, List Fish. Malaya, p. 33, 1938 (reference).

Coilia (*Coilia*) *reynaldi* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 141, pl. (8) 266, fig. 1, 1866–72 (Bengal).

Depth 6 in total length; head 7. Snout overhangs upper jaw; eye 4 in head, equals snout, 1½ in interorbital; maxillary reaches nearly to end of opercles, close to pectoral origin; teeth fine in both jaws.

Scales 55 in medial lateral series; 10 or 11 transversely. Abdominal scutes 12, extend on preventral.

D. I,–III, 11, origin at first fourth of total length; A. 116, below or slightly beyond hind dorsal edge, continuous with caudal; caudal rays 10; pectoral rays 5 or 6+12, upper rays prolonged nearly to middle of body; ventral rays 6.

Silvery white, with pinkish reflections. (Day.)

India, Burma, Malay Peninsula, Pinang, Singapore. Originally based on young examples 100 mm. long.

COILIA REBENTISCHII Bleeker

Coilia bebentischii BLEEKER, Act. Soc. Sci. Indo-Néerl., vol. 5, No. 7, p. (2)5, 1859 (type locality: Sinkawang, Borneo; error).

Coilia rebentischi BLEEKER, Act. Soc. Sci. Ind. Néerland., (Borneo), vol. 8, p. 27, 1860 (Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 51, 1913 (compiled).

Coilia (*Coilia*) *rebentischi* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 140, pl. (8)256, fig. 3, 1866–72 (Borneo).

Engraulis grayi (not Bleeker) KNER, Reise *Novara*, Fische, p. 333, 1865 (Java).

Coilia ramcarati (part) GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 402, 1868 (type of *Coilia bebentischii*).

Depth 6¼; head 5½. Snout shorter than eye, slightly prominent; eye about 5; maxillary not reaching hind preopercle edge, more or less truncate behind. Scales 65 in medial lateral series; 9 or 10 transversely. Abdominal scutes 2 or 3 + 9 or 10.

D. I, 14, more than twice nearer snout than caudal base; A. 94, 1⅔ in body; pectoral rays 28, 19 uppermost produced, far surpassing anal origin; ventral rays 7, inserted slightly before dorsal origin.

Yellowish; back, dorsal, and anal dusky. Length, 125 mm. (Weber and Beaufort.)

Borneo, in estuaries. Only the type known.

Subgenus CHOETOMUS McClelland

COILIA MYSTUS (Linnaeus)

Clupea mystus LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 319, 1758 (type locality: Indian Sea).—OSBECK, Reise Ost-Ind. China, p. 335, 1765 (China).—LINNAEUS, Syst. Nat., ed. 12, vol. 1, p. 524, 1766 (copied).—BONNATERRE, Tabl. encyclop. Ichth., p. 187, pl. 100, fig. 410, 1788 (Indian Seas).—GMELIN, Syst. Nat. Linnaeus, vol. 1, p. 1408, 1789 (copied).—WALBAUM, Artedi Pisc., vol. 3, p. 43, 1792 (copied).—FORSTER, Fauna Indica, p. 16, 1795.—SCHNEIDER, Syst. Ichth. Bloch, p. 428, 1801 (Indian Seas).

Engraulis mystus VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 73, 1848 (Chinese drawing).

Mystus mystus RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 66 (Swatow).

Coilia mystus JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, p. 359, 1926 (Hong Kong; Port Arthur, Manchuria).—TANAKA, Jap. Fish. Life Colours, No. 49, 1933.

Mystus clupeoides LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 466, 467, 1803 (type locality: Sea of the Indies).

Coilia clupeoides GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 404, 1868 (Chinese seas).—BLEEKER, Verh. Akad. Wet. Amsterdam, vol. 18, p. 3, 1879 (Shanghai).—KÁROLI, Termesz. Füzetek, Budapest, vol. 5, p. 183, 1881 (Canton).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, Math.-nat. Kl., vol. 102, pt. 1, p. 237, 1893 (Swatow).—ELERA, Cat. Fauna Filip., vol. 1, p. 581, 1895 (Luzon, Cavite, Santa Cruz).—CHABANAUD, Service Océanogr. Pêches, Indo-Chine, 1ᵉ note, p. 8, 1926 (Cochinchina; Pnompenh).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6ᵉ note, pp. 115, 174, 1929 (Cochinchina, Annam, Tonkin).—BORODIN, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (Saigon).

Choetomus playfairii McClelland, Calcutta Journ. Nat. Hist., vol. 4, p. 405, pl. 24, fig. 3, 1844 (type locality: China).

Coilia playfairii Richardson, Voy. *Sulphur*, Ichth., p. 100, pl. 54, figs. 3–4, 1844 (China Seas, Chusan, Yangtze Kiang mouth, Canton, Hong Kong); Ichth. China Japan, p. 309, 1846 (Chinese Seas, Chusan, Yangtze Kiang, Canton River, Hong Kong).—Valenciennes, Hist. Nat. Poiss., vol. 21, p. 86, 1848 (copied).

Collia nasus Schlegel, *in* Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 243, pl. 109, fig. 4, 1846 (type locality: Seas of Japan).

Coilia nasus Günther, Cat. Fishes British Mus., vol. 7, p. 405, 1868 (Ningpo, Amoy, China); Ann. Mag. Nat. Hist., ser. 4, vol. 12, p. 250, 1873 (Shanghai).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 404, 1876 (Shanghai).—Peters, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).—Károli, Termesz. Füzetek, Budapest, vol. 5, p. 183, 1881 (Ningpo River).—Günther, Ann. Mag. Nat. Hist., ser. 6, vol. 4, p. 219, 1889 (Kiu Kiang).—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 9, 1897.—Günther, Ann. Mag. Nat. Hist., ser. 7, vol. 1, p. 263, 1898 (Newchang).—J. F. Abbott, Proc. U. S. Nat. Mus., vol. 23, p. 490, 1901 (Tsien Tsin).—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 54, 1901 (reference).—Jordan and Starks, Proc. U. S. Nat. Mus., vol. 31, p. 516, 1906 (Port Arthur, Manchuria).—Jordan and Herre, Proc. U. S. Nat. Mus., vol. 31, p. 640, 1906 (China, Korea).—Franz, Abh. Bayer. Akad. Wiss., vol. 4, Suppl. vol. 1, p. 5, 1910 (Sagami Bay).—Garman, Mem. Mus. Comp. Zool., vol. 40, No. 4, p. 113, 1912 (Kiating).—Izuka and Matsuura, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 183, 1920 (Chikugo).—Mori, Hand List Manchurian East. Mongolian Vertebr., p. 154, 1927 (reference); Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—Nichols, Bull. Amer. Mus. Nat. Hist., vol. 58, art. 1, p. 3, 1928 (Shanghai, Ning Po, Pei Ho, Tientsin; Anhwei).—Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 25, fig. 19, 1929 (Amoy).—Schmidt, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 21, 1931 (Fusan).

Mystus nasus Fowler, Bull. Amer. Mus. Nat. Hist., New York, vol. 50, p. 373. 1924 (Ninghwo).

Osteoglossum prionostoma Basilewsky, Nouv. Mém. Soc. Nat. Moscou, vol. 10, p. 244, 1855 (type locality: "Pekin; sinu Tschiliensi et mari orientalis").

Coilia grayi (not Richardson) Kner, Reise *Novara*, Fische, p. 335, 1865 (Hongkong).

Coilia ectenes Jordan and Seale, Proc. U. S. Nat. Mus., vol. 29, p. 517, fig. 1, 1906 (type locality: Shanghai).—Jordan and Starks, Proc. U. S. Nat. Mus., vol. 31, p. 516, 1906 (Port Arthur, Manchuria).—Evermann and Shaw, Proc. California Acad. Sci., ser. 4, vol. 16, p. 100, 1927 (Hangchow, Chuchi, Nanking, Yangtze River).—Mori, Hand List Manchurian East. Mongolian Vertebr., p. 153, 1927; Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan and Jinsen, Korea).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 592 (Shanghai), p. 601, 1930 (Hongkong; note).—Kimura, Journ. Shanghai Sci. Inst., sect. 3, vol. 3, p. 104, 1935 (Tsung Ming, Yangtze-kiang).

? *Coilia brachygnathus* Kreyenberg and Pappenheim, Sitzber. Ges. Nat. Freunde Berlin, p. 96, 1908 (type locality: Tungtin and Hankau); Abh. Ber. Mus. Magdeburg, vol. 2, pt. 1, p. 10, 1909 (Yangtze Kiang).—Nichols, Bull. Amer. Mus. Nat. Hist., vol. 58, art. 1, p. 3, 1928 (Tungting Lake, Hunan).

Depth 7 to 8½; head 5¾ to 6⅖, width 2¼ to 2⅔. Snout 4¼ to 4½ in head; eye 4¾ to 6, 1 to 1½ in snout, 1⅗ to 1⅘ in interorbital; maxillary reaches slightly beyond pectoral origin, length 4¾ to 4⅞ in combined head to caudal base; interorbital 2¾ to 3⅛ in head, broadly convex. Gill rakers 18 to 20+22 or 23, finely lanceolate, equals snout; gill filaments equal ⅖ gill rakers.

Scales thin, rather caducous, 70 to 75 in median lateral series to caudal base; 10 transversely, 21 to 23 predorsal. Abdominal serrae 18 or 19+32 or 33. Scales with 1 to 3 basal striae joining reticulations apically; circuli very fine, concentric, feeble or absent from greater apical portion of scales.

D. III, 12, I, first branched ray 1⅒ to 1¼ in head, also low procumbent spine anterior to dorsal origin; A. II, 100 or 102, first branched ray 2⅞ to 3; caudal 1⅒ to 1⅖, ends in median point behind; pectoral with uppermost rays ending in 6 long filaments, reaching 1¼ to 3 their length to caudal base; ventral 2 to 2⅕ in head.

Back pale brownish, sides and lower surfaces silvery white. Iris white. Fins all pale brownish.

China, Japan, Korea.

U.S.N.M. No. 57180. Japan. P. L. Jouy. Length, 222–254 mm. 4 examples.
U.S.N.M. No. 62377. Port Arthur. J. F. Abbott. Length, 80–188 mm. 21 examples.

COILIA MACROGNATHOS Bleeker

Coilia macrognathos Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 3, p. (409) 436, 1852 (type locality: Pamangkat, Borneo); Verh. Batav. Genootsch. (Haring.), vol. 24, p. 50, 1852 (Pamangkat); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 6, p. 2, 1858 (Sinkawang, Borneo).—Martens, Preuss. Exped. Ost-Asien, vol. 1, p. 404, 1876 (Bangkok).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 96, 1935 (Paknam; Bangkok); vol. 89, p. 132, 1937 (Bangkok; Tachin).

Coilia (*Chaetomus*) *macrognathus* Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 138, pl. (3)261, fig. 4, 1866–72 (Borneo).

Coilia macrognathus Günther, Cat. Fishes British Mus., vol. 7, p. 406, 1868 (type).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 49, 1913 (type).—Hora, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 174, 1923 (Nontaburi).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 620, 1926 (Sarawak).—Hardenberg, Treubia, vol. 14, livr. 2, p. 217, 1933 (Kumai River); vol. 15, livr. 3, p. 228, 1936 (Pontianak; Padang Tikarbay, Borneo).

Coila macrognathus Suvatti, Index Fish. Siam, p. 16, 1937 (Gulf of Siam; Pak-kret; Chonburi) (error).

Coilia macrognathus aequidentata Chabanaud, Bull. Mus. Hist. Nat. Paris, vol. 30, p. 59, 1924 (type locality, "embouchures du fleuve de Saigon"); Service Océanogr. Pêches Indo-Chine, 1e note, p. 8, 1926 (Cochinchina).

Depth about 4; head 4⅔ to 5. Snout prominent, long as eye; eye 5 to 5½; maxillary long, sword shaped, reaches far beyond pectoral base, with row of alternating smaller and stronger teeth on its whole border. Lower gill rakers 22, not quite 2 in gill filaments, long as eye.

Scales 58 to 62 in medial lateral series; 10 or 11 transversely. Abdominal scutes 12 or 13+27 to 30, strongly spiniferous.

D. I–14 or 15, more than twice as near snout end as caudal; A. 62 to 73, length 2 to 2¼ in body length; pectoral rays 16 or 17, with 5 or 6 uppermost produced or surpassing anal origin; ventral rays 7, inserted just behind dorsal origin, almost twice as near subopercle as anal.

Silvery, back darker. Fins hyaline, front half of dorsal and border of anal and caudal dusky. Length, 260 mm. (Weber and Beaufort.)

Siam, Borneo, in estuaries.

COILIA GRAYII Richardson

Coilia grayii RICHARDSON, Voy. *Sulphur*, Ichth., p. 99, pl. 54, figs. 1–2, 1844 (type locality: China Seas); Ichth. China Japan, p. 309, 1846 (Chinese Seas; Canton).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 405, 1868 (China).—SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 5, p. 107, 1881 (Swatow).—ELERA, Cat. Fauna Filip., vol. 1, p. 581, 1895 (Luzon, Cavite, Santa Cruz).

Coilia grayi BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 18, 1853.—JORDAN and SEALE, Bull. Mus. Comp. Zool., vol. 67, p. 361, 1926 (China, Hong Kong).—CHABANAUD, Service Océanogr. Indo-Chine, 1^{e} note, p. 8, 1926 (Tonkin).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6^{e} note, p. 174, 1929 (Hué).

Coilia (Chaetomus) grayii BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 148, 1874 (copied; Canton; Hong Kong ?).

Mystus grayi RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 66 (compiled).

Coilia clupeoides (not Lacépède) FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 58, p. 307, 1920 (Soochow).

Depth 4¾ to 5⅔; head 5⅕ to 6, width 2 to 2⅛. Snout 4 to 4⅕ in head; eye 4⅖ to 5, 1 to 1¼ in snout, 1¾ to 2 in interorbital; maxillary reaches well beyond pectoral base, expansion 1⅕ to 1¼ in eye, length 3⅔ to 4⅖ in combined head and body to caudal base; interorbital 2⅖ to 2⅞ in head, broadly convex. Gill rakers 17 to 21+30 to 32, slenderly lanceolate, equal eye; gill filaments ½ to ⅔ of gill rakers.

Scales very caducous, 58 to 60 (pockets) in lateral series to caudal base; 13 or 14 transverse, 13 to 14 predorsal. Abdominal serrae 15 to 17+23 to 28. Scales with 13 to 15 marginal basal striae converging medially, also apically with reticulations; circuli very fine, semiconcentric and medially on scale variably concentric, absent over greater apical portion of scales.

D. III, 9, first branched ray 1 ? to 1⅛ in head; A. II, 80 to II, 83, second ray 3⅛ ? to 3⅕; caudal 2¼ ?, apparently pointed (damaged); pectoral ray 2$\frac{1}{10}$ to 2⅘ to caudal base, with uppermost 6 rays filamentous; ventral 2 to 2¼ in head.

Pale brownish generally, with silvery reflections on sides. Iris whitish gray due to formalin. Dorsal and anal grayish terminally. Paired fins pale.

China. Reported from the Philippines by Elera.

U.S.N.M. No. 47999. Cochinchina. Lyons Museum. Length, 190 mm.

U.S.N.M. No. 83983. Soochow, China. N. Gist Gee. Length, 133 mm., caudal ends damaged.

COILIA LINDMANNI Bleeker

Coilia lindmanni Bleeker, Act. Soc. Sci. Ind. Néerl., No. 9, vol. 3, p. (7)48, 1858 (type locality: Palembang, Sumatra).

Coilia lindmani Bleeker, Nederland. Tijdschr. Dierk., vol. 2, pp. 35, 176, 1865 (Siam).—Günther, Cat. Fishes British Mus., vol. 7, p. 405, 1868 (type).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 49 1913 (compiled).—Chabanaud, Service Océanogr. Pêches Indo-Chine, 1ᵉ note, p. 8, 1926 (Cambodia).—Hardenberg, Treubia, vol. 13, livr. 3–4, p. 411, fig. 1, 1931 (Palembang); vol. 14, livr. 2, p. 217, 1933 (Sunsang).

Coilia (Chaetomus) lindmani Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 139, pl. (12)270, fig. 2, 1866–72 (Sumatra).

Coila lindmani Suvatti, Index Fish. Siam, p. 16, 1937 (Maenam Bangpakong) (error).

Depth 4½; head about 5. Snout prominent, shorter than eye; eye nearly 4; maxillary rather narrow, reaches below pectoral base, with small nearly equal teeth. Lower gill rakers about 34.

Scales 50 in medial lateral series. Abdominal scutes 12+19.

D. I-13, about 2 times nearer snout than caudal base; A. 76, less than twice in body length; pectoral rays 17, 6 uppermost produced slightly or very much beyond anal origin; ventral rays 7.

Silvery, back dark, fins clear. Length, 176 mm. (Weber and Beaufort.)

Siam, Sumatra.

Family CHIROCENTRIDAE

Body much elongated, strongly compressed. Eyes small, with adipose lids. Mouth large, greatly inclined. Premaxillaries large; maxillaries long and narrow, with 2 supplemental bones, all forming border to mouth. Mandible prominently protruded. Canine teeth in front of premaxillaries and mandibulary bones, other teeth long and pointed; few teeth on palatines and tongue. Gill membranes separate and free. Gill rakers very short and strong. No pseudobranchiae. Scales thin, small, cycloid, very deciduous. Paired fins with long axillary scales and two long scales on caudal base. Dorsal above front part of long anal. Caudal deeply forked. Pectorals low. Ventrals very small.

One living genus and several as fossils from the Cretaceous of Europe, Brazil, and Syria and the Eocene of Switzerland.

Genus CHIROCENTRUS Cuvier

Chirocentrus CUVIER, Règne animal, vol. 2, p. 178, 1817. (Type, *Clupea dorab* Forskål, monotypic).

Jeosudis CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 118, 1873. (Type, *Neosudis vorax* Castelnau. monotypic).

Abdominal edge trenchant, not serrated. Head small. Mouth cleft wide, superior. Teeth in narrow bands on palatines, pterygoids, and tongue. Opercular apparatus complete. Gill openings wide. Branchiostegals 8. Stomach with blind sac. Pyloric appendages none. Mucous membranes of intestine with spiral fold suggestive of spiral valve in elasmobranchs. Air bladder large, cellular. Lateral line obsolete. Dorsal fin short, posterior or behind middle. Ventral with 7 rays, midway between pectoral and anals.

Two species according to Bleeker and they have been further elucidated by the studies of Dr. J. D. F. Hardenberg.

ANALYSIS OF SPECIES

a^1. Depth 7; head 6; maxillary not reaching preopercle; gill rakers 3+14 or 15. **dorab**

a^2. Depth 5½; head 5⅔; maxillary reaches beyond preopercle; gill rakers 5+16 or 17________________ **nudus**

CHIROCENTRUS DORAB (Forskål)

Clupea dorab FORSKÅL, Descript. Animal., pp. XIII, 7, 1775 (type locality: Djedda and Mochha, Red Sea).—BONNATERRE, Tableau encycylop. Ichth., p. 187, 1788 (Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1409, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 42, 1792 (copied).—LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 425, 459, 1803 (Arabia).—JOUAN, Mém. Soc. Sci. Imp. Sci. Nat. Cherbourg, vol. 8, p. 306, 1861 (Kanala, New Caledonia); vol. 21, p. 335, 1877–78 (on 1861).

Chirocentrus dorab RÜPPELL, Neue Wirbelth., Fische, p. 81, 1835 (Red Sea).—VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 150, pl. 565, 1846 (Coromandel, Malabar, Mauritius, Bouru, New Guinea, Zanzibar, Muscat, Red Sea, Java).—RICHARDSON, Ichth. China Japan, p. 311, 1846 (Canton, seas of China).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1259, 1849 (Malay Peninsula and Islands).—JERDON, Madras Journ. Lit. Sci., p. 146, 1851.—PETERS, Arch. Naturg., p. 268, 1855 (Mozambique).—BLEEKER, Act. Soc. Sci. Indo-Néerl., vol. 5, No. 9, p. 3, 1859 (Nagasaki).—DAY, Fishes of Malabar, p. 223, 1865.—KNER, Reise *Novara*, Fische, p. 340, 1865 (Madras).—BLEEKER, Atlas Ichth. Ind. Néerl., vol. 6, p. 92, pl. (13) 271, fig. 3, 1866–72 (Java, Madura, Sumatra, Singapore, Bintang, Banka, Borneo, Celebes, Buru, Amboina, New Guinea); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 300, 1868 (Waigiu).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 475, 1868 (Zanzibar, Port Natal, Bengal, Pinang, Amboina, East Indies, China, Japan).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 606, 1871 (Koseir, Red Sea).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 445, 1876 (Mauritius), p. 849 (New Pomerania), 1877.—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 405, 1876 (Singapore).—PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p. 846, 1877 (New Britain).—ALLEYNE and MACLEAY, Proc. Linn. Soc. New South Wales, vol. 1, p. 351, 1877 (Cape York).—DAY, Fishes of India, pt. 4, p. 652, pl. 166, fig. 3, 1878.—Klunzinger, Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, p. 418, 1879 (Queensland).—Günther, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 50, 1880 (Somerset, Cape York).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 263, 1881 (Port Jackson, Cape York); vol. 7, p. 594, 1883 (New Guinea); vol. 8, p. 210, 1883 (Lower Burdekin River, Queensland).—Meyer, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 43, 1885 (Manila Bay).—Ogilby, Cat. Fish. New South Wales, p. 57, 1886.—Boulenger, Proc. Zool. Soc. London, 1887, p. 666 (Muscat).—Day, Fauna British India, Fishes, vol. 1, p. 368, fig. 114, 1889.—Kent, Great Barrier Reef, p. 302, 1893 (Torres Straits).—Elera, Cat. Fauna Filip., vol. 1, p. 585, 1895 (Luzon, Cavite, Santa Cruz).—Steindachner, Ann. Hofmus. Wien, vol. 11, p. 226, 1896 (Bangkok).—Jordan and Snyder, Annot. Zool. Japon., vol. 3, p. 52, 1901 (reference).—Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 327, 1902 (Formosa).—Duncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 186, 1904 (Kuala Lumpur, Muar River).—Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang).—Jordan and Herre, Proc. U. S. Nat. Mus., vol. 31, p. 641, 1906 (Misaki).—Smith and Seale, Proc. Biol. Soc. Washington, vol. 19, p. 73, 1906 (Mindanao).—Jordan and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 4, 1907 (Cavite).—Evermann and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 53, 1907 (Bacon and San Fabian).—Lloyd, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—Jordan and Richardson, Bull. Bur. Fisher., vol. 27 (1907), p. 236, 1908 (Manila); Mem. Carnegie Mus., vol. 4, p. 165, 1909 (Takao).—Gilchrist and Thompson, Ann. South African Mus., vol. 6, p. 202, 1908–11 (Natal).—Günther, Journ. Mus. Godeffroy, vol. 8, pt. 16, p. 388, 1909 (Indian Ocean).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (Padang examples).—Bean and Weed, Proc. U. S. Nat. Mus., vol. 42, p. 590, 1912 (Batavia).—Weber, *Siboga* Exped., vol. 57, Fische, p. 10, 1913 (West Ceram).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 18, fig. 11, 1913 (Batavia, Cheribon, Madura).—Gilchrist and Thompson, Ann. Durban Mus., vol. 1, p. 295, 1917 (reference).—Fowler, Copeia, No. 58, p. 62, 1918 (Philippines).—Fowler and Bean, Proc. U. S. Nat. Mus., vol. 62, p. 2, 1922 (Cebu).—Hora, Mem. Asiatic Bengal, vol. 6, p. 480, 1924 (Tale Sap, Siam).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 623, 1926 (Sarawak).—McCulloch and Whitley, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1926 (reference).—Chabanaud, Service Oceanogr. Peches Indo-Chine, 1^e note, p. 7, 1926 (Annam; Gulf of Siam).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 256, 1927 (Vigan).—McCulloch, (Bombay); Mem. Bishop Mus., vol. 10, p. 28, 1928 (Fiji).—Pillay, Journ. Bombay Nat. Hist. Soc., vol. 32, p. 253, 1927 (Bombay); vol. 33, p. 103, 1928 Fishes New South Wales, ed. 2, p. 15, pl. 4, fig. 48a, 1927.—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).—Tirant, Service Océanogr. Pêches Indo-Chine, 6^e note, pp. 30, 124, 174, 1929 (Thudoumot).—McCulloch, Austral Mus. Mem., vol. 5, p. 36, 1929 (reference).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 589, 1930 (Hong Kong).—Delsman, Treubia, vol. 12, livr. 1, p. 46, 1930 (egg and larva).—Hardenberg, Treubia, vol. 12, livr. 1, p. 51, 1930 (Batavia).—Fowler, Hong Kong Nat., vol. 2, p. 52, fig. 4, 1931 (Hong Kong, East Indies, Philippines); Mem. Bishop Mus., vol. 11, p. 315, 1931 (reference).—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 13, 1934 (Unisan; Capiz; Cebu; Dumaguete; Jolo.)—Roxas, Philippine Journ. Sci., vol. 55, p. 247, pl. 1, fig. 9 (scale), 1934

(Luzon; Tablas; Samar; Panay; Guimaras; Leyte; Bantayan; Mindanao; Basilan).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 410, 1934 (Natal).—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, vol. 45, ser. 3, p. 13, 1935–36 (Massaua).—HERRE, Field Mus. Nat. Hist. Pub. 353, zool. ser. vol. 21, p. 29, 1936 (Fiji).—HORA and MUKERJI, Rec. Indian Mus., vol. 38, p. 18, 1936 (Maungmagan).—ROXAS and MARTIN, Dep. Agr. Comm. Manila Tech. Bull. 6, p. 19, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 9, 1937 (Gulf of Siam).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 130, 1937 (Paknam); List. Fish. Malaya, p. 23, 1938 (reference).

Chinocentrus dorab OGILBY, Mem. Queensland Mus., vol. 5, p. 96, 1916 (Queensland). (Error.)

Chirocentrus darab BORODIN, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (Manila). (Error.)

Clupea dentex SCHNEIDER, Syst. Ichth. Bloch, p. 428, 1801 (type locality: Red Sea).

Esox chirocentrus LACÉPÈDE, Hist. Nat. Poiss., vol. 5, 1803, pp. 296, 317, pl. 8, fig. 1, 1803 (no locality). (On Commerson.)

Neosudis vorax CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 118, 1873 (type locality: Noumea, New Caledonia).—FOWLER, Mem. Bishop Mus., vol. 10, p. 66, 1928 (copied).

Chirocentrus dorab vorax WHITLEY, Proc. Linn. Soc. New South Wales, vol. 54, abstract No. 429, 1929 (reference); Rec. Austral Mus., vol. 18, p. 101. 1931 (note).

Depth 7¼ to 7⅓; head 5⅓ to 5⅔, width 3⅛ to 3½. Snout 3⅔ to 4¼ in head from snout tip; eye 4 to 4⅔, 1 to 1⅓ in snout, greater than interorbital; maxillary reaches ¼ to ½ in eye, slender, length 1⅞ to 2 in head from snout tip; upper teeth small, except 2 moderate front canines; mandibular symphysis with 2 small sharp teeth, 6 elongate on each ramus, gradually longer posteriorly and mandibular rami greatly elevated inside mouth; interorbital 5½ to 6½, scarcely elevated, median ridge not extended beyond eye. Gill rakers 3+11, long, compressed, well spaced, shorter than long gill filaments.

Scales very small, deciduous. Well developed scaly dorsal and anal sheaths. Pectoral with both broad outer and axillary scaly flap. Ventral with small inner flap. Caudal base scaly. Scales all fallen in preserved materials.

D. IV, 13, I or 12, I, fourth simple ray 2¼ to 2½ in total head length; A. IV, 30, I, fourth simple ray 3 to 3⅛; least depth of caudal peduncle 2⅖ to 2⅘; pectoral spine 1½ to 2; ventral 5½ to 7⅔; caudal 4⅕ to 4½ in rest of body.

Back brown, sides and below whitish. Dorsal and caudal brownish, other fins pale pink.

Red Sea, Arabia, Zanzibar, Mozambique, Natal, Mauritius, India, Malay Peninsula, Pinang, Singapore, Siam, East Indies, Philippines, China, Formosa, Japan, Queensland, New South Wales, Melanesia.

1894. Cebu market. September 4, 1909. Length, 105 mm. Depth 6½.
4541. Manila market. December 26, 1907. Length, 271 mm.
22545, 22546. Manila market. January 13, 1908. Length, 229–252 mm.

13191. Makassar market, Celebes. December 22 1909. Length, 182 mm.

U.S.N.M. No. 6701. Hongkong. William Stimpson. Length, 465 mm. Depth 7⅓.

U.S.N.M. No. 47842. Fiji. Australian Museum (A9399). Length, 330–477 mm., caudal broken. Depth 6½ to 7½.

U.S.N.M. No. 47990. Cochin China. Lyons Museum. Length, 320 mm., caudal broken. Depth 7.

U.S.N.M. No. 55989. Mindanao, Philippines. Bureau of Fisheries (4233). Length, 520 mm. Depth 7.

U.S.N.M. No. 56201. Bureau of Fisheries (4179). Length, 402 mm. Depth 6⅞ mm.

U.S.N.M. No. No. 57484. Japan. P. L. Jouy. Length 270 mm. Depth 6⅗.

U.S.N.M. No. 63658. Bureau of Fisheries (4181). Length, 415 mm., caudal broken. Depth 6⅘.

U.S.N.M. No. 72490. Batavia, Java. Bryant and Palmer. 1909. Length, 165 mm. Depth 7.

U.S.N.M. No. 72491. Batavia, Java. Bryant and Palmer. 1909. Length, 325 mm. Depth 7⅗.

U.S.N.M. No. 84210. Philippines. Dr. Fred Baker. Length, 154 mm. Depth 6½ mm. Very poor example.

1 example A.N.S.P. Padang, Sumatra. A. C. Harrison and H. M. Hiller. Length, 391 mm. When in arrack deep dusky bluish green on back and head above. Body, sides, and lower surface silvery white. Dorsal, caudal and pectorals dusky greenish. Anals and ventrals white. Peritoneum pale.

CHIROCENTRUS NUDUS Swainson

Chirocentrus nudus Swainson, Nat. Hist. Animals, Fishes, vol. 2, 1839, p. 294, 1839 (on *Wahlah* Russell, Fishes of Coromandel, vol. 2, p. 78, pl. 199, 1803 (type locality: Vizagapatam).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 410, 1934 (Natal).

Chirocentrus hypselosoma Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 3, p. (54) 71, 1852 (type locality: Singapore; Samarang); Nederland. Tijdschr. Dierk., vol. 1, p. 240, 1863 (Obi); Atlas Ichth. Ind. Néerland., vol. 6, p. 93, pl. (11) 269, fig. 3, 1866–72 (Java, Pinang, Singapore, Banka, Borneo, Celebes, Batjan, Obi Major).—Delsman, Treubia, vol. 12, livr. 1, p. 46, 1930 (egg and larva).—Hardenberg, Treubia, vol. 12, livr. 1, p. 51, 1930 (Bagan-sî-Apî-Apî, Sumatra, Batavia); vol. 13, livr. 1, p. 99, 1931; vol. 15, livr. 3, p. 226, 1936 (Padang Tikarbar, Borneo).

Chirocentrus dorab (not Forskål) Cantor, Journ. Asiatic Soc. Bengal. vol. 18, p. 1259, 1849 (part).—Günther, Cat. Fishes British Mus., vol. 7, p. 475, 1868 (part).—Day, Fishes of India, pt. 4, p. 652, 1878 (part).—Günther, Journ. Mus. Godeffroy, pt. 16, p. 388, 1909 (part).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 18, 1913 (part).—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 32, No. 2, p. 253, 1927 (off Bombay).—McCulloch, Australian Mus. Mem., vol. 5, p. 36, 1929 (part).—Fowler, Proc. Acad. Nat. Sci., Philadelphia, vol. 89, p. 130, 1937 (Tachin); List Fish. Malaya, p. 23, 1938 (part).

Depth 5 to 5¼; head 3¾ to 4, width 3¾ to 4. Snout 3½ to 3⅔ in head from snout tip; eye 4⅓ to 4½, 1⅛ to 1⅕ in snout, greater than interorbital; maxillary reaches ½ in eye, slender, 1⅔ to 2 in head from snout tip; interorbital 5 to 5¼, scarcely elevated, level;

cheek and opercle with radiating venules. Gill rakers 7+18, finely lanceolate, more than twice gill filaments or 1¼ in eye.

Scales minute, feeble, most all fallen. Abdominal myomeres 24+13.

D. III, 14 to III, 16, first branched ray 2⅞ to 3⅒ in total head length; A. III, 28 to III, 30, first branched ray 2½ to 2⅞; caudal 1⅛ to 1⅕; least depth of caudal peduncle 2⅞ to 3¼; pectoral 1⅗ to 2; ventral 3¾ to 4¾.

Brown, paler to light below. Neutral brown diffuse streak from above gill opening to middle of caudal base. Head with brown tint. Fins all pale. Iris gray.

India, Pinang, Singapore, East Indies.

3 examples A.N.S.P. Off Bombay. Prof. F. Hallberg. Length, 81–92 mm.

Family GONORYNCHIDAE

Body greatly elongated, tapers behind. Head small, conic. Snout rather long, pointed. Eye large. Barbel below end of snout. Upper edge formed by short premaxillaries, and extends down as thick lip before maxillary. Jaws toothless. Lips thickly fringed with barbels. Nostrils double. Opercular apparatus well developed. Gill openings narrow. Pseudobranchiae present. Acessory branchial organ behind fourth gill arch, partly attached to fourth arch and partly to humeral arch. Branchiostegals 4. Air bladder absent. Vertebrae 65, of which 20 caudal. Head and body entirely covered with fine ctenoid scales. Dorsal far back, opposite ventrals and short like anal. Caudal forked. Pectorals low, fold like ventrals. Ventral rays 9 or 10,

Besides the living *Gonorynchus* the fresh-water Eocene *Notogoneus* of Montana and France appears to differ only in the edentulous palate and tongue, besides its advanced dorsal. Several other fossils from the Upper Cretaceous of Westphalia and Syria have also been placed with the present family.

Genus GONORYNCHUS Scopoli

Gonorhynchus Gronow, Zoophylacii, 1763, p. 55. (Species nonbinomial.) (Type, *Cyprinus gonorynchus* Linnaeus, tautotypic.)

Gonorynchus Scopoli, Introd. Hist. Nat., p. 450, 1770. (Atypic.) (Type, *Cyprinus gonorynchus* Linnaeus.)

Gonorincus Rafinesque, Analyse de la nature, p. 88, 1815. (Type, *Cyprinus gonorynchus* Linnaeus.)

Gonorhyncus Sollas, Zool. Record, vol. 42, 1905, p. 48, 1906. (Type, *Cyprinus gonorynchus* Linnaeus.)

Gonorrynchus Ogilby, Ann. Queensland Mus., No. 10, p. 32, 1911. (Type, *Cyprinus gonorynchus* Linnaeus.)

Rynchana Richardson, Voy. *Erebus* and *Terror*, Fishes, p. 44, 1846. (Type, *Rynchana greyi* Richardson, monotypic.)

Rhynchacus JORDAN and EVERMANN, Genera of fishes, pt. 1, p. 19, 1917. (Type, *Rynchana greyi* Richardson).

Rhynchana JORDAN, Genera of Fishes, pt. 3, p. 407, 1919. (Type, *Rynchana greyi* Richardson.)

Body partly cylindrical. Snout protrudes. Eyes covered by skin. Mouth small, inferior. Lips fleshy. Round patch of blunt conic teeth on each pterygoid, opposed to similar patch on hyoid bone. No free tongue. Gill membranes broadly united with isthmus. Gill rakers few and short. Paired fins with fleshy, pointed, scaly flaps. Caudal scaly basally. Lateral line distinct. Fins all short.

Apparently a single widely distributed species in the cooler regions of the Indo Pacific, formerly admitted, though more recently grouped as several nominal species.

ANALYSIS OF SPECIES

a^1. Head $4\frac{1}{4}$ to $4\frac{1}{2}$; A. 8 or 9.
  b^1. Pectoral $1\frac{1}{5}$ to $1\frac{1}{4}$ in head ---------- abbreviatus
  b^2. Pectoral $1\frac{1}{3}$ in head ---------- moseleyi
a^2. Head $4\frac{1}{2}$ to $5\frac{1}{8}$; A. 8 or 10.
  c^1. Space between dorsal origin and caudal base 2 to $2\frac{1}{5}$ in predorsal space. greyi
  c^2. Space between dorsal origin and caudal base $1\frac{9}{10}$ to 2 in predorsal space. gonorynchus

GONORYNCHUS ABBREVIATUS Schlegel

Gonorhynchus abbreviatus SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 217, pl. 103, fig. 5, 1846 (type locality: Japan).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 56, 1901 (reference); Smithsonian Misc. Coll. vol. 45, p. 236, pl. 59, 1904 (Yokohama).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 643, fig. 5, 1906 (Yokohama).—FRANZ, Abh. Bayer. Akad. Wiss., vol. 4, Suppl., vol. 1, p. 6, 1910 (Misaki).—JORDAN and THOMPSON, Mem. Carnegie Mus., vol. 6, p. 209, 1914 (Misaki).—IZUKA and MATSUURA, Cat. Zool. Spec. Mus. Tokyo Vertebrata, p. 181, 1920 (Izu).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 153, 1925 (Mikawa Bay).—CHABANAUD, Bull. Soc. Geol. France, ser. 5, vol. 1, p. 506, 1931 (reference).

Gonorrynchus abbreviatus OGILBY, Ann. Queensland Mus., No. 10, p. 33, 1911 (compiled).

Gonorhynchus greyi (not Valenciennes) ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 9, 1897 (reference).

Gonorhynchus gonorhyncus (not Linnaeus) TANAKA, Jap. Fish. Life Colours, No. 50, 1933.

Depth $8\frac{3}{5}$ to 9; head $4\frac{3}{7}$ to $4\frac{1}{2}$. Snout $2\frac{1}{2}$ in head; eye $2\frac{1}{2}$, $1\frac{4}{5}$ in snout, $1\frac{1}{8}$ in interorbital, adipose lid covering eye; single median barbel $\frac{1}{2}$ of eye, on lower front part of snout; mouth inferior, nearly semicircular, opposite last third in snout length; lips thick, fringed; jaws toothless; interorbital 4 in head, low.

Scales 180 in lateral line to caudal base, small, cover head and body. Dorsal, anal, and paired fins with long pointed basal scaly flaps.

D. II, 9, I, first branched ray 1⅘ in head; A. II, 7, I, first branched ray 2; caudal 2, little emarginate behind; least depth of caudal peduncle 4; pectoral 1⅕ to 1¼, rays I, 10; ventral rays I, 7, fin 2 in head.

Brown, paler to whitish below. Fins largely gray-black terminally, paler basally. Pectoral with pale border.

Length, 284 mm. (Jordan and Herre.)

Japan.

GONORYNCHUS MOSELEYI Jordan and Snyder

Gonorhynchus moseleyi JORDAN and SNYDER, Journ. Washington Acad. Sci., vol. 13, p. 347, 1923 (type locality: Honolulu).—CHABANAUD, Bull. Soc. Geol. France, ser. 5, vol. 1, p. 507, 1931 (reference).

Gonorhynchus gonorhynchus (not Linnaeus) FOWLER, Occas. Pap. Bishop Mus., vol. 8, No. 7, p. 375, 1923 (Honolulu); Mem. Bishop Mus., vol. 10, p. 28, 1928 (Honolulu).

Depth 8½; head 4¼, width 2⅛. Snout 2⅔ in head; eye 4½; preoral 4⅛; interorbital 3⅘. Barbel half of eye.

Scales 150 in lateral line to caudal base and 10 more on latter; 16 above lateral line, 16 below lateral line; 115 predorsal scales forward to snout tip. Scales with 12 basal radiating striae, edge evenly scalloped; 11 or 12 apical denticles, graduated down from median, which largest and strongest.

D. II, 8, I, origin slightly behind ventral origin, fin but little larger; A. II, 6, I, inserted midway between ventral origin and caudal base, fin long as ventral; caudal emarginate, 1⅗ in head; pectoral 1⅓.

When fresh pale sandy gray above. Under surface of head and body, edges of pectoral and ventral, all of anal, and bases of dorsal and caudal, white. Median terminal portions of paired fins blackish. Iris pale yellow.

Hawaiian Islands.

1 example. A.N.S.P. Honolulu market. 1922. Bishop Museum. Length, 123 mm.

GONORYNCHUS GREYI (Richardson)

Rhynchana greyi RICHARDSON, Voy. *Erebus* and *Terror*, Fishes, p. 44, text fig. (mouth), pl. 29, figs. 1–6, 1846 (type locality: West Australia; New Zealand).

Gonorhynchus greyi VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 212, 1846 (New Zealand).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 373, 1868 (type of *Rhynchana greyi;* West and South Australia, Melbourne; New Zealand).—HECTOR, Colonial Mus. Governm. Survey Dept. (Fishes New Zealand), p. 62 (Wellington Harbor), p. 119, pl. 10, fig. 98, 1872 (Hutt River mouth).—MACLEAY, Proc. Linn. New South Wales, vol. 6, p. 255, 1881 (West and South Australia, Victoria).—OGILBY, Proc. Linn. Soc. New South Wales, vol. 23, p. 730, 1898 (Lord Howe Island).—MCCULLOCH, Fishes New South Wales, ed. 2, p. 17, pl. 5, fig. 58a, 1927.—CHABANAUD, Bull. Soc. Geol. France, ser. 5, vol. 1, p. 507, 1931 (reference).

Gonorhynchus grayi KNER, Reise *Novara*, Fische, pl. 16, fig. 1a–c, 1865.

Gonorrhynchus greyi Klunzinger, Arch. Naturg., vol. 38, p. 42, 1872 (Hobson's Bay).—Ogilby, Ann. Queensland Mus., No. 10, p. 34, 1911 (on Richardson).

Gonorhyncus greyi Lucas, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 36, 1890 (Victoria).

Gonorynchus greyi McCulloch, Australian Mus. Mem., vol. 5, p. 52, 1929 (reference).

Gonorhynchus gonorynchus (not Linnaeus) Waite, Rec. Austral. Mus., vol. 5, p. 146, pl. 17, fig. 3, 1904 (Lord Howe Island; New South Wales); Mem. New South Wales Naturalists Club, No. 2, p. 13, 1904; Rec. Canterbury Mus., vol. 1, No. 1, p. 11, 1907 (reference); Trans. New Zealand Inst., vol. 42, 1909, p. 374, 1910 (Kermadek Island); Rec. South Australian Mus., vol. 2, p. 40, fig. 57, 1921.—Fowler, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 160, 1936 (Melbourne).

Gonorhynchus gonorhynchus Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 220 (Melbourne); 1923, p. 43 (Melbourne examples).

Gonorrynchus forsteri Ogilby, Ann. Queensland Mus., No. 10, p. 34, 1911 (type locality: New Zealand).

Gonorhynchus forsteri Chabanaud, Bull. Soc. Geol. France, ser. 5, vol. 1, p. 507, 1931 (reference).

Gonorrynchus parvimanus Ogilby, Ann. Queensland Mus., No. 10, p. 34, 1911 (type locality: Woody Point, Moreton Bay, South Queensland).

Gonorhynchus parvimanus Chabanaud, Bull. Soc. Zool. France, ser. 5, vol. 1, p. 507, 1931 (reference).

Depth 9 to 10; head 5 to 5⅛, width 2⅗ to 2¾. Snout 2⅔ to 3 in head; eye 4 to 4¼, 1½ in snout; maxillary reaches ⅘ to eye; lips fleshy, fringed, papillose; interorbital 5⅛ to 8 in head. Gill filaments 2 in eye.

Scales 145 to 175 in lateral line to caudal base and 5 or 6 more on latter; 14 to 18 above, 13 or 14 below, 150 to 175 predorsal. Scales ctenoid, exposed edges truncate, more or less caducous, on trunk and tail in evenly oblique uniform series, uniform in size. Large slender, free, pointed, fleshy scaled flap in pectoral axil ⅔ of fin; similar one in ventral axil; caudal and dorsal mostly covered with scales basally, other fins scaleless. Lateral line complete, tubes simple.

D. v, 8, i, sometimes v, 7, i, first branched ray 2 in head; A. v, 5, i, sometimes v, 6, i, first branched ray 2 to 2⅛; caudal emarginate, subequal with head; least depth of caudal peduncle 3¾ to 4; pectoral 1⅕ to 1¼; ventral 1⅔ to 1⅚.

Dull or pale gray to drab brown, lighter below. Eye dark or gray. Inside mouth and gill opening black. Fins pale gray brown, with slight yellowish tinge basally, terminally black.

Queensland, New South Wales, Victoria, Tasmania, Western Australia, South Australia and New Zealand.

4 examples. A.N.S.P. Melbourne market, Victoria, Mrs. Agnes F. Kenyon. Length, 273–293 mm.

GONORYNCHUS GONORYNCHUS (Linnaeus)

Cyprinus gonorynchus LINNAEUS, Syst. Nat., ed. 12, vol. 1, p. 528, 1766 (type locality: Cape of Good Hope).—BONNATERRE, Tabl. encyclop. Ichth., p. 194, 1788 (Cape of Good Hope).—WALBAUM, Artedi Pisc., vol. 3, p. 25, 1792 (copied).—LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 497, 1803 (description in key).

Cyprinus gonorhynchus GMELIN, Syst. Nat. Linn., vol. 1, p. 1422, 1789 (Cape of Good Hope).—LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 570, 1803 (Cape of Good Hope).

Cobitis gonorynchus GRAY, Cat. Fish. Gronow, p. 41, 1854 (Cape of Good Hope).

Gonorrynchus gonorynchus OGILBY, Ann. Queensland Mus., No. 10, p. 32, 1911 (compiled).

Gonorhynchus gonorhynchus GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 299, 1917 (reference).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 125, pl. 6, fig. 4 (copied), 1925 (Port Nolloth, Table Bay, False Bay, Natal).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 194 (Natal coast, in "600 fathoms").—BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 1017, 1927 (comments on Fowler's 600 fathoms misprint).—CHABANAUD, Bull. Soc. Geol. France, ser. 5, vol. 1, p. 507, 1931 (reference).

Gonorhynchus gonorynchus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 413, 1934 (Natal); Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 160, fig. 63, 1936 (part).

Gonorhynchus gronovii VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 207, pl. 568, 1846 (type locality: Bourbon).—SCHLEGEL, *in* Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 217, 1846 (reference).—BLEEKER, Nat. Tijdschr. Nederland. Indie, vol. 21, p. 56, 1860 (reference).—GUICHENOT, Notes ile Réunion, vol. 2, p. 29, 1863.

Gonorhynchus brevis KNER, Reise *Novara*, Fische, p. 342, 1865 (type locality: St. Paul, southern Indian Ocean).

Gonorhynchus greyi (not Richardson) GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 373, 1868 (Cape of Good Hope).—GILCHRIST, Marine Invest. South Africa, vol. 6, p. 153, 1901 (copied).—GILCHRIST and THOMPSON, Ann. South African Mus. vol. 6, p. 200, 1908–11 (26 fathoms Annatikulu River mouth, northwest ½ N. 9½ miles).

Depth 11; head 4½. Snout 2½ in head; eye 4½; maxillary 4 as not measured from snout tip; barbel ¾ of eye; interorbital 4 in head.

Scales 142 in lateral line to caudal base; 15 above, 13 below, predorsal 104.

D. II, 9, inserted slightly behind ventral origin, fin but little larger; A. II, 7, inserted midway between ventral origin and caudal base; caudal emarginate; pectoral 1⅔ in head; ventral 2.

Pale broccoli brown, nearly whitish below. Iris silvery white. Dorsal with blackish terminal blotch. Anal with blackish on last half. Each caudal lobe with white tips and medially dusky. Pectoral whitish. Ventral largely whitish, with median dusky blotch.

South Africa, Bourbon, and St. Paul Rock. Barnard mentions the accessory branchial organ behind the fourth gill arch. He also says the youngest example he has seen measures 75 mm. and is extraordinarily slender, and he gives the depth for the young as 11½.

A.N.S.P. 53065. Natal coast, in 60 fathoms. 1924. H. W. Bell Marley. Length, 100 mm.

Series OSTARIOPHYSI

Front or anterior vertebrae modified, interlocked, enlarged, coössified and some with their upper and lateral portions detached to form a series of small bones or weberian ossicles, connecting the auditory apparatus with the air bladder. The air bladder thus apparently an organ of hearing by means of a connection which lost in all higher fishes.

This great group includes the majority of all freshwater fishes. But two of the four orders are here considered, as I report only the few Philippine cyprinoids and siluroids. The latter include also the marine forms. The numerous East Indian species are well treated in the great works of Bleeker and in more recent years by Weber and Beaufort. The forms of more remote relationship such as those in the Indian region and the quite distinct fauna of the Chinese mainland are omitted because they are not represented in the *Albatross* Philippine collections.

Order NEMATOGNATHI

Body variously short to greatly elongate or even eellike. Head very variable, sometimes extremely large, wide or depressed, again very small. Mouth not protractile, premaxillaries usually forming its upper borders. Lips sometimes greatly developed, sometimes modified as sucking disk. Mouth with long barbels, usually at least one pair from rudimentary maxillaries, often one or more pairs about chin and sometimes one from each pair of nostrils. Subopercle absent or modified as uppermost branchiostegal. Four front vertebrae joined together, with chain of small bones as weberian apparatus to auditory organ of skull. Skin thick, slimy, or with bony plates on head and about pectoral fins. No true scales ever present. Adipose fin frequently present. Usually teeth on jaws, vomer and pterygoids. Pharyngeal bones with small conic or villiform teeth. Branchiostegals 4 to 17. No pseudobranchiae. Intestinal canal simple, short to elongate. No pyloric coeca. Lateral line usually present, sometimes with branches. Fin rays articulated, second dorsal ray and outer pectoral ray modified as spine due to co-ossification of articulations. Pectorals placed low, fold like ventrals. Ventral rays 6 to 16, frequently about 6.

A great group known usually as the catfishes. They include over a thousand species chiefly in the fresh waters of the globe, most of which are found between the tropics. The few forms known from the Philippines, excepting the Clariidae, are mostly marine.

ANALYSIS OF FAMILIES

a^1. Dorsal spineless, very long; adipose fin present or absent---------- **Clariidae**

a^2. Dorsal with pungent spine.

- b^1. Caudal pointed, confluent with so-called long second dorsal and anal; no adipose fin-- **Plotosidae**
- b^2. Caudal forked, emarginate or truncate, without procurrent portion; anal short; adipose fin present---------------------------------- **Tachysuridae**

Family CLARIIDAE

Body elongate. Head broad, depressed. Eyes small. Mouth transverse, terminal or subterminal. Barbels 4 pairs, as 1 nasal, 1 maxillary, and 2 mandibulars. Jaws with more or less united areas of villiform teeth. Vomer with crescentic band of villiform teeth. Front nostril in short tube each side behind upper lip. Hind nostril more or less rounded slit behind each nasal barbel. Cranial roof with occipital and frontal fontanel, occipital part prolonged. Cranium with upper portions covered with osseous plates, lateral portions often naked, forming casque covering accessory branchial chamber of gill cavity containing accessory dendritic gills attached to second and fourth branchial arches. Gill membranes shortly united, deeply notched in middle, free from isthmus. Gill rakers 13 to 19. Branchiostegals 7 to 9. Air bladder small, bilobed, disposed transversely and partially enclosed in bony sheath. Long dorsal and anal entirely of soft rays, united with caudal or dorsal shorter or followed by adipose fin. Pectoral with outer ray spinous. Ventral rays 6. Paired fins sometimes rudimentary or absent.

A large family of freshwater siluroids, more or less eellike in appearance, some especially so or with the paired fins rudimentary or absent. Most are furnished with an accessory dendritic breathing organ within the branchial chamber which enables them to live continuously for long periods of time on land. Some are known to live in burrows during dry weather and crawl out at night in search of food.

ANALYSIS OF GENERA

a^1. No adipose fin on back; dorsal long, nearly or quite reaches caudal or may be confluent--- **Clarias**

a^2. Adipose fin present behind rayed dorsal and like anal confluent with caudal. **Heterobranchus**

Genus CLARIAS Scopoli

Clarias Gronow, Zoophylacii, p. 100, 1763. (Species nonbinomial.) (Type, *Clarias marpus* Valenciennes=*Silurus batrachus* Linnaeus, designated by Bleeker, Nederland. Tijdschr. Dierk., vol. 1, p. 120, 1863.)

Chlarias SCOPOLI, Introd. Hist. Nat., p. 455, 1777. (Type, *Silurus batrachus* Linnaeus.) (Evident misprint for *Clarias*.)

Clarius BLEEKER, Act. Soc. Sci. Indo-Néerl., vol. 4, p. 28, 1858. (Type, *Silurus batrachus* Linnaeus.)

Macropteronotus LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 84, 1803. (Type, *Macropteronotus charmuth* Lacépède=*Silurus anguillaris* Linnaeus, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 65, 1917.)

Cossyphus (not Valenciennes) MCCLELLAND, Calcutta Journ. Nat. Hist., vol. 4, p. 403, 1844. (Type, *Cossyphus ater* McClelland=*Macropteronotus jagur* Buchanan-Hamilton.)

Phagorus MCCLELLAND, Calcutta Journ. Nat. Hist., vol. 4, p. 403, 1844. (Type, *Cossyphus ater* McClelland, virtually. *Phagorus* McClelland proposed to replace *Cossyphus* McClelland.)

Body well elongated, long tail tapering. Head greatly depressed. Eye well advanced in head, lids free. Sides of head protected by bony plates. Branchiostegals 9. Air bladder with bony sheath formed by transverse processes of fourth and fifth vertebrae. Vertebrae 60 to 78. Males with long conic anal papilla. Paired fins well developed.

Throughout Africa and western Asia to India, Ceylon, Burma, Siam, Malaya, East Indies, Philippines, Indochina and China.

ANALYSIS OF SPECIES

a^1. Pectoral spine smooth, rough or with few and not very prominent serratures.
  b^1. Dorsal and anal united with caudal, at least with its base______ nieuhofi
  b^2. Median fins not united.
    c^1. Dorsal 60 to 78; anal 45 to 63.
      d^1. Occipital process triangular, with blunt top, height twice its base; front border of fontanel reaches opposite line through middle of eyes or farther forward.
        e^1. Space between dorsal fin and occipital process 4½ to 5½ in head from snout end to occipital process; head to occipital process 3½ to 3⅔ in body without caudal________________________ batrachus
        e^2. Space between dorsal fin and occipital process 2½ in head from snout end to occipital process, 4 or 5 in body without caudal. teijsmanni
      d^2. Occipital process triangular, top rounded, height nearly 3 times base; front border of front fontanel nearly reaches opposite hind border of eyes____ leiacanthus
    c^2. Dorsal 58 to 63; anal 38 to 40______________________________ fuscus
a^2. Pectoral spine with more or less vertical strong teeth on front edge. dussumieri

CLARIAS NIEUHOFI Valenciennes

Clarias nieuhofi VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 386, 1840 [on *Bontael of negenoogen* Nieuhof, Gedenkw. Zee en lantreize, vol. 1, pt. 2, p. 271, 1682 (type locality: Oostindien)].—BLEEKER, Atlas Ichth, Ind. Néerland., vol. 2, pl. (51)99, fig. 2, 1862.—GÜNTHER, Cat. Fishes British Mus., vol. 5, p. 20, 1864 (Philippines).—ELERA, Cat. Fauna Filip., vol. 1, p. 566, 1895 (Philippines).—SUVATTI, Index Fish. Siam, p. 84, 1937 (Nong Kho; Trat River, Khau Saming).

Clarias nieuhofii Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 105, 1862 (Java, Sumatra, Banka, Biliton, Borneo).—Peters, Monatsb. Akad. Wiss. Berlin, 1868, p. 271 (Luzon).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, vol. 16, p. 166, 1880 (Borneo).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 189, 1913 (East Indies, Malacca, Philippines).—Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 47, 1937 (reference).—Fowler, List Fish. Malaya, 1938, p. 44(247) (reference).

Phagorus nieuhofii Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 461 (Borneo); 1915, p. 228 (same example).

Clarias pentapterus Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 2, p. 206, 1851 (Bandjermassin, in rivers and marshes, Borneo).

Clarias gilli Smith and Seale, Proc. Biol. Soc. Washington, vol. 19, p. 74, figs. a–b, 1906 (type locality: Rio Grande, Mindanao).—Herre, Philippine Journ. Sci., vol. 24, p. 700, 1924 (Tatuan, Mailag, Santa Fe, Lake Batu); Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1570, 1924 (Lake Bato and Bicol River, Luzon); Fish. Herre Philippine Exped. 1931, p. 23, 1934 (Fort Pikit, Cotabato).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 47, 1937 (reference).

Depth 8⅓; head to hind opercle edge 6½, width equals length, 1⅓ in length to hind edge of occipital process. Snout 2⅖ in head to hind opercle edge; eye 13, 4½ in snout, 5¾ in interorbital; mouth width 2¼ in head to hind opercle edge; nasal barbel reaches hind edge of gill opening, maxillary reaches beyond pectoral tip for space equal to that between front nostril and eye; outer mental reaches tip of pectoral spine, inner mental to gill opening; broad bands of fine pointed teeth in each jaw, in 5 or 6 irregular rows; broad triangular patch of similar teeth; front nostril at last third of snout as seen in profile; interorbital 2$\frac{1}{10}$ in head to hind gill opening, broad, very slightly convex; front fontanel twice eye diameter, its front edge opposite hind eye edge and hind fontanel ⅔ front one, opposite pectoral origin; predorsal 2⅞ in head from occipital process. Gill rakers 5+17, lanceolate, subequal with gill filaments or twice eye.

Skin smooth, also over entire top of head.

D. 86, last ray half joined with caudal basally, fin height 2⅓ in head to hind gill opening; A. about 72, fin height 2½, free from caudal; caudal 1¼ in head, convex behind; least depth of caudal peduncle 3⅓; pectoral 1⅔, spine 1½ in fin, smooth; ventral 3.

Generally uniform olivaceous in alcohol.

British Malaya, East Indies, Siam, Philippines.

A.N.S.P. No. 20350. Knapei or Sebroeang, Borneo. N. Chaper. Museum of Paris. E. D. Cope. Length, 347 mm.

5170. Iloilo market. June 1, 1908. Length, 228 mm.

CLARIAS BATRACHUS (Linnaeus)

Silurus batrachus Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 305, 1758 (type locality: In Asia, Africa); ed. 2, vol. 1, p. 502, 1766.—Bonnaterre, Tableau Encyclop. Ichth., p. 151, 1788 (Asia, Africa).—Gmelin, Syst. Nat. Linn., vol. 1,

p. 1355, 1789.—WALBAUM, Artedi Pisc., vol. 3, p. 565, 1792 (on Linnaeus).—BLOCH, Naturg. ausländ. Fische, vol. 8, p. 44, pl. 370, fig., 1794 (Tranquebar).—SCHNEIDER, Syst. Ichth. Bloch, p. 386, 1801 (Tranquebar, Africa).

Macropteronotus batrachus LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 84, 85, 1803 (Asia, Africa).

Clarias batrachus VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 385, 1840 (on Bloch).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 2, p. 103, pl. (50) 98, fig. 2, 1862 (Java, Bali, Sumatra, Singapore, Banka, Biliton, Borneo, Bengal).—KNER, Reise *Novara*, Fische, p. 299, 1865 (Hong Kong, Java, Ceylon).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 271, 1868 (Catbalogan, Samar).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 190, fig. 74, 1913 (Batavia, Buitenzorg, Serang, Situ Bagendit, Tragan, Lawang, Djember, Lombok, lakes Sinkarah, Manindjan, Taluk, Solok, Atjah, Simalur).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1915, p. 226 (Padang materials); Copeia, No. 58, p. 62, 1918 (Philippines).—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 165, 1923 (Bangkok).—VIPULYA, Journ. Nat. Hist. Soc. Siam, vol. 6, No. 2, p. 227, 1923 (reference).—HERRE, Philippine Journ. Sci., vol. 24, p. 199, 1924 (Tuao, Aparri, Vigan, Santa Maria, Pampanga, Bulacan, Manila, Cavite, Jaro); Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1570, 1924 (Luzon, Leyte); Philippine Journ. Sci., vol. 34, p. 296 (Lake Taal), p. 303, 1927 (Lake Naujan).—HERRE, Journ. Pan-Pac. Res. Inst., vol. 8, No. 4, p. 7, 1933 (Dumaguete); Fish. Herre Philippine Exped. 1931, p. 23, 1934 (San Fabian; Laguna de Bay; Dumaguete).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, 1934 (Lake Bratan, Bali), p. 86 (Chieng Mai; Chieng Dao, Keng Tung), p. 335, 1934 (Ban Thun Luang); vol. 89, p. 133, 1937 (Me Poon; Pitsanulok).—SUVATTI, Index Fish. Siam, p. 82, 1937 (Ko Chang; Thale Sap; Tadi Stream; Maenam Pau Phaya; Maenam Pattani; Maekok; Kwan Phayau; Chieng Mai; Maenam Pasak; Bangkok; Comthong; Paknampho; Ayuthaya; Rahaeng; Pracinburi).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 46, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 65, 1937 (Singapore; Ayer Hitam; Johore; Chandradam, Perak).—FOWLER, List Fish. Malaya, p. 43, 1938 (247) (reference).

Chlarias batrachus FOWLER, Journ. Acad. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang); Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 461, (Baram, Borneo).

Macropteronotus jagur BUCHANAN-HAMILTON, Fishes of Ganges, pp. 145, 374, 1822 (type locality: Ganges River).—DAY, Fauna British India, Fishes, vol. 1, p. 115, 1889 (thought to be monstrosity).

Clarias jagur VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 388, 1840 (copied).—GÜNTHER, Cat. Fishes British Mus., vol. 5, p. 21, 1864 (copied).—MARTENS, Preuss. Exped. Ost Asien, vol. 1, pp. 302, 399, 1876 (Danau Sriang, Borneo).—DAY, Fishes of India, pt. 3, p. 484, 1877 (note).

Macropteronotus magur BUCHANAN-HAMILTON, Fishes of Ganges, pp. 146, 374, pl. 26, fig. 45, 1822 (type locality: Ganges River).

Clarias magur VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 381, 1840 (compiled).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 5, p. 17, 1864 (types of *Macropteronotus magur*, Calcutta, Pinang, Khaysa, East Indies, India).—DAY, Fishes of India, pt. 3, p. 485, pl. 112, figs. 5–5a, 1877.—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 38, 1884 (South Sea).—DAY, Fauna British India, Fishes, vol. 1, p. 115, figs. 48–49, 1889.—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 9, 1889, p. 191, 1890 (Rangoon, Mandalay, Bhamo).—JORDAN and SEALE, Bull. Bur. Fisher., vol. 26 (1906), p. 8, 1907 (Philippines); Proc. U. S. Nat. Mus., vol. 33, p. 535, 1908.—FOWLER, Mem. Bishop Mus., vol. 11, p. 318, 1931 (note on Pöhl's record).

Clarias fuscus (not Lacépède) VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 383, 1840 (Sumatra).

Clarias punctatus VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 384, 1840 (type locality: Java).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1245, 1849 (Pinang).

Cossyphus ater MCCLELLAND, Calcutta Journ. Nat. Hist., vol. 4, p. 403, pl. 22, fig. 3, 1844 (type locality: Chusan, China); vol. 5, p. 225, 1845 (errata) (mutilated specimen).

? *Clarias assamensis* DAY, Fishes of India, pt. 3, p. 485, 1877 (type locality: Goalpara and as high as Suddya); Fauna of British India, Fishes, vol. 1, p. 117, 1889 (copied).

Clarias olivaceus FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, pl. 28, lower fig., 1904 (type locality: Padang, Sumatra).

Depth 5⅖ to 7; head 5 to 5⅘, wide as long. Snout 2¾ in head to hind edge of opercle; eye 10; mouth width 2⅖; nasal barbel reaches base of pectoral spine, maxillary not quite to tip of pectoral spine, outer mental half its length and inner reaches base of pectoral spine; teeth fine, in rather broad bands in jaws; narrow band of fine vomerine teeth; interorbital 1⅔, flattened, fontanel like plumb bob, length equals space between 2 nasal barbels; predorsal length to occiput 3¾ to 4¾ in head measured to hind opercle edge.

Skin smooth.

D. 58, origin above depressed pectoral tip, fin separate from caudal; A. 50, similar, origin much nearer caudal base than snout tip; caudal 1½ in head measured to hind opercle edge, fin rounded behind; pectoral spine 1½, nearly smooth, fin reaches nearly half way to ventral; ventral 2⅕ in head to hind opercle edge, reaches anal.

In arrack dark brown, vertical fins somewhat darker. Along lower side, from abdomen to caudal base an irregular series of small round pale brown spots. Below dorsal base on back about dozen vertical series of similar spots extending down to middle of side.

India, Ceylon, Burma, Pinang, East Indies, Philippines.

12105. Manila market. June 11, 1908. Length, 235. D. 65 ? A. 50.

U.S.N.M. No. 72550. Buitenzorg, Java. March 10, 1909. Bryant and Palmer. Length, 20 to 24 mm. 5 examples.

U.S.N.M. No. 72551. Buitenzorg, Java. March 16, 1909. Length, 185 mm.

U.S.N.M. No. 72551. Java. Bryant and Palmer. Head 95 mm. lond, doubtfully as *Clarias batrachus*.

2 examples. A.N.S.P. Padang, Sumatra. A. C. Harrison and H. L. Hiller. Length, 200–204 mm.

2 examples. A.N.S.P. Batu Sangkar, Sumatra. A. C. Harrison and H. L. Hiller. Length, 233–249 mm.

CLARIAS TEIJSMANNI Bleeker

Clarias teijsmanni BLEEKER, Nat. Tijds. Nederland. Indië, vol. 13, p. 344, 1857 (type locality: Java); Atlas Ichth. Ind. Néerland., vol. 2, p. 104, pl. (51) 99, fig. 1, 1862 (Java; Borneo).—FOWLER, List Fish. Malaya, p. 44 (247), 1938.

Clarias teysmanni GÜNTHER, Cat. Fish. Brit. Mus., vol. 5, p. 19, 1864 (Java; Ceylon).—DAY, Fishes of India, pt. 3, p. 484, 1877 (types of *Clarias brachysoma*).—VINCIGUERRA Ann. Mus. Stor. Nat. Civ. Genova, vol. 16, p. 164, 1880 (Borneo).—DAY, Fauna Brit. India, vol. 1, p. 116, 1889 (copied).—VAILLANT, Nouv. Arch. Mus. Hist. Nat., Paris, ser. 3, vol. 5, p. 62, 1893 (Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 191, 1913 (Buitenzorg, Java; Lake Toba, Sumatra; Singkep; Borneo).—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, No. 2, p. 165, 1923 (Nakon Sritamarat).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 610, 1926 (Sarawak).—SUVATTI, Index Fish. Siam, p. 84, 1937 (Khlong Phong).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 66, 1937 (Singapore; Gwnong Pulai, Johore; River Plus near Lasah, Perak).

Clarias brachysoma GÜNTHER, Cat. Fishes British Mus., vol. 5, p. 20, 1864 (type locality: Ceylon).

Depth 7 to 8; head to hind end of gill opening 5⅓ to 6 or more, head to occipital process 4 to 5, width equals length. Eyes 10 to 11 in head to hind end of gill opening; eye distance greater than mouth width, equals postorbital part of head; nasal barbels reach occipital process, maxillary reach pectorals or surpass them, mandibulary and mental much shorter; maxillary teeth in 2 contiguous quadrangular patches, twice broad as long; mandibular teeth similar but hind corners laterally extended; vomerine teeth in crescentic band, its hind edge sometimes more or less prominent medially; space between occipital process and dorsal origin 2½ times in space from former to snout end; occipital fontanel conspicuously shorter than frontal fontanel, which extends to front border of eye. Gill rakers 16, shorter than gill filaments.

D. 70 to 74; A. 60 to 63; caudal rounded, free from dorsal and anal; pectoral rounded, equals or little longer than head without snout, very weak short spine ½ to ⅔ of fin length, much shorter than postorbital part of head to hind edge of gill opening, front border little rough and rays 7 to 9; ventral rounded, extend on anal, ⅔ of pectorals, rays 6.

Dark, underside of head and belly lighter. Body and tail with light spots, dorsally arranged in transverse rows. Median fins with lighter border. Length over 200 mm. (Weber and Beaufort.)

Ceylon, Malacca, Java, Sumatra, Borneo.

CLARIAS LEIACANTHUS Bleeker

Clarias leiacanthus BLEEKER, Nat. Tijds. Nederland. Indië, vol. 2, p. 430, 1851 (type locality: Sambas, in rivers, Borneo); Atlas Ichth. Ind. Néerland., vol. 2, p. 104, pl. (50) 98, fig. 1, 1862 (Sumatra, Banka, Nias, Borneo).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 611, 1926 (Sarawak).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 87, 1934 (Bangkok).—SUVATTI, Index Fish. Siam, p. 83, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 65, 1937 (Mawai District).—FOWLER, List Fish. Malaya, p. 247, 1938 (reference).

Clarias liacanthus GÜNTHER, Cat. Fishes British Mus., vol. 5, p. 20, 1864 (type).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, vol. 16, p. 166, 1880

(Borneo).—ELERA, Cat. Fauna Filip., vol. 1, p. 566, 1895 (Paragua).—STEINDACHNER, Abh. Senck. Ges., vol. 25, p. 443, 1900 (Baram River, Borneo).—POPTA, Notes Leyden Mus., vol. 27, p. 18, 1906 (Central Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 192, 1913 (East Indies).

Chlarias leiacanthus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 461 (Baram River, Borneo).

Clarias macrocephalus GÜNTHER, Cat. Fishes British Mus., vol. 5, p. 18, 1864 (type locality: Siam).—KÁROLI, Termész. Füzetek, Budapest, vol. 5, p. 177, 1881 (Siam).—SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 7, p. 154, 1883 (Menam).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 40, 1885 (Laguna de Bay, Luzon).—WEBER, Zool. Ergebn. Reise Niederland. Ost-Inden. vol. 3, p. 419, 1894 (Pajakomboh, Sumatra).—ELERA, Cat. Fauna Filip., vol. 1, p. 565, 1895 (Luzon, Manila, Laguna de Bay).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p 193, 1913 (noted as doubtful).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 47, 1937 (reference).—SUVATTI, Index Fish. Siam, p. 83, 1937 (Bangkok; Maenam Cau Phya; Klong Ko; Samrong Canal; Paknampho; Canthabura; Maeklong; Tadi Stream; Kamburi River; Thale Noi; Pracinburi).

Depth 6¾; head to hind edge of gill opening 5⅘, width 1¼. Snout 2⅗ in head; eye 13, 5¼ in snout, 7¾ in interorbital; mouth width 2¼ in head to hind opercle edge; lips and barbels all more or less papillate; nasal barbel reaches pectoral origin, maxillary 1½ eye diameters beyond depressed pectoral fin, outer mental to tip of pectoral spine, inner mental to pectoral origin; teeth fine, conic, in rather broad bands in jaws, also little broader crescentic band on palate; interorbital 2 in head, broadly and slightly convex; front fontanel 2½ times eye, hind one equals eye; occipital process broadly convex, length about ⅓ its basal width. Gill rakers 4+11, lanceolate, ½ gill filaments which little over twice eye diameter.

Skin smooth.

D. about 62, last ray for ⅗ basal length joined with caudal, fin height 1⅗ in head to hind opercle edge; A. 63, last ray joined with caudal ⅔ its length, fin height 1⅘ in head; caudal 1⅔, rounded behind; pectoral 1⅗, spine ¾ fin length with row of very small sharp points along its upper edge; ventral 3 in head.

Dull olivaceous generally, slightly paler on belly and under surface of head. Barbels like back. About dozen or more series of obscure small spots or dots, paler than general color along lower part of side, these all more or less connected by 2 or 3 longitudinal rows of similar dots below axis on flank and another row well below.

British Malaya, Siam, East Indies, Philippines? My example appears to differ from most accounts of this species in its spotted coloration and partly confluent vertical fins.

1 example. A.N.S.P. Baram River, Borneo. A. C. Harrison and H. L. Hiller. 1899. Wistar Institute of Anatomy. Length, 189 mm.

CLARIAS FUSCUS (Lacépède)

Macropteronotus fuscus Lacépède, Hist. Nat. Poiss., vol. 5, pp. 84, 88, pl. 2, fig. 2, 1803 (type locality: China=on Chinese painting).

Clarias fuscus Valenciennes, Hist. Nat. Poiss., vol. 15, p. 383, 1840 (not Sumatra specimen).—Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 105, 1862 (copied).—Günther, Cat. Fish. Brit. Mus., vol. 5, p. 18, 1864 (type of *Clarias pulicaris*, China, Hongkong).—Sauvage and Dabry, Ann. Sci. Nat., ser. 6, vol. 1, Zool., p. 5, 1874 (China).—Károli, Termesz. Füzetek, Budapest, vol. 5, p. 177, 1881 (Canton).—Elera, Cat. Fauna Filip., vol. 1, p. 565, 1895 (Luzon, Manila).—Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 168, fig. 5, 1909 (Takao).—Fowler, Bull. Bishop Mus. 22, p. 5, 1925 (introduced at Guam); Proc. Acad. Nat. Sci. Philadelphia, vol. 79, 1927, p. 260 (San Fernando, Vigan, Philippines); Mem. Bishop Mus., vol. 10, p. 64, 1928 (Guam record); Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 602 (Hong Kong).—Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 55, fig. 45, 1929 (Amoy).—Roxas and Martin, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 41, 1937 (reference).

Chlarias fuscus Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 57 (Swatow).—Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 321, fig. 4, 1902 (Taihoku and Formosa).

? *Clarias abbreviatus* Valenciennes, Hist. Nat. Poiss., vol. 15, p. 386, 1840 (type locality: Macao) (Anal rays 32).—Günther, Cat. Fishes British Mus., vol. 5, p. 19, 1864 (copied).—Sauvage and Dabry, Ann. Sci. Nat., ser. 6, vol. 1, Zool., p. 5, 1874 (Macao).

Clarias pulicaris Richardson, Voy. *Sulphur*, Ichth., p. 135, pl. 62, figs. 5–6, 1844 (type locality: China); Ichth. China Japan, p. 287, 1846 (China).

Clarias hexacicinnus Richardson, Ichth. China Japan, p. 287, 1846 (type locality: China).

Clarias batrachus (not Linnaeus) Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 103, 1862 (part).—Fowler, Copeia, No. 50, p. 62, 1917 (Philippines).

Depth 5⅖ to 5¾; head to hind opercle edge 4⅕ to 4¼, to hind occipital edge 3¾ to 3⅚, head width 1⅓ to 1⅖. Snout 3¼ to 3⅓ in head to opercle edge; eye 13⅘ to 14, 6¾ to 7 in interorbital; mouth width 3⅙ to 3½; bands of villiform teeth in jaws, slightly wider band of coarser ones on vomer; nasal barbel to pectoral origin or middle; maxillary barbel to pectoral middle or 2 eye lengths beyond pectoral; mental barbels subequal, to first fourth or tip of pectoral spine; interorbital 2⅕ to 2¼ in head to opercle edge, broadly convex, depressed medianly; front fontanel begins opposite eye center, 2¼ to 2½ eye lengths; occipital fontanel subequal with eye, begins opposite or little behind pectoral origin. Gill rakers 6+22, lanceolate.

Head covered with thin skin.

D. 58 to 63, height 2⅕ to 2¼ in head; A. 38 to 40, height 2¾ to 3; caudal 1⅗ to 1¾, convex; pectoral 1⅔ to 1⅞, spine ⅔ to ¾ of fin, edges with very fine obsolete concealed serrae; ventral 2⅙ to 2½.

Neutral dusky, head below and belly whitish. Dozen vertical rows of small gray-white spots on sides and lower side of tail with several irregular longitudinal rows. Barbels dusky slate. Iris slate. Dorsal, anal and caudal dusky. Paired fins brown, pale basally.

China, Formosa, Philippines.

6858. Kowloon market, China. October 22, 1908. Length, 128 mm. Dorsal rays 56.

6859. Kowloon market. October 22, 1908. Length, 125 mm. Dorsal rays 57.

U.S.N.M. No. 42463. Hongkong. William Stimpson. Length, 127–133 mm. 5 examples.

1 example. A.N.S.P. San Fernando, Luzon. Rev. Joseph Clemens.

8 examples. A.N.S.P. Vigan, Luzon. Rev. Joseph Clemens.

5 examples. A.N.S.P. Philippines. Commercial Museum of Philadelphia. As *Clarias batrachus.*

CLARIAS DUSSUMIERI Valenciennes

Clarias dussumieri VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 382, 1840 (type locality: Malabar; Pondicherry).—JERDON, Madras Journ. Lit. Sci., vol. 15, p. 342, 1849 (Malabar).—DAY, Fishes of Malabar, p. 197, 1865 (fresh water); Fishes of India, pt. 3, p. 484, 1877 (Wynaad in Malabar); Fauna British India, Fishes, vol. 1, p. 117, 1889.

Clarias melanoderma BLEEKER, Nat. Geneesk. Arch. Nederl. Indië, vol. 3, pt. 2, pp. 178, 288, 1846 (type locality: Java); Atlas Ichth. Ind. Néerland., vol. 2, p. 102, pl. (49) 97, fig. 2, 1862 (Java, Banka, Borneo).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 5, p. 19, 1864 (no locality).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, vol. 14, p. 386, 1879 (Kaju Tanam, Sumatra).—KÁROLI, Termesz. Füzetek, Budapest, vol. 5, p. 177, 1881 (Macao).—MEYER, Anal. Soc. Españ. Hist. Nat. Madrid, vol. 14, p. 40, 1885 (Laguna de Bay).—ELERA, Cat. Fauna Filip., vol. 1, p. 566, 1895 (Luzon, Camarines Sur, Laguna de Batos, Laguna de Bay).—VOLZ, Zool. Jahrb. Abth. Syst. vol. 19, p. 381, 1904 (Palembang, Sumatra).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 188, 1913 (East Indies, Philippines, Siam, China).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 47, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 66, 1937 (Singapore I.; Mawai District, Johore).—FOWLER, List Fish. Malaya, p. 44, 1938 (reference).

Clarias meladerma SUVATTI, Index Fish. Siam, p. 84, 1937 (reference).

Clarias melasoma BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 427, 1852 (type locality: Prabrekarta, south east Borneo, in Kusan River; Palembang, south east Sumatra, in Mussi River).

Clarias melanosoma BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 427, 1852 (Borneo).

Clarias batrachus (not Linnaeus) BLEEKER, Atlas Ichth. Ind. Néerland., vol. 2, p. 103, 1862 (part).

Depth 5½ to 7; head to hind opercle edge 5 to 5¾, 4 to 4¼ measured to occipital process, long as wide. Eye 10 to 12 in head, eye distance nearly equals mouth width, 1½ to 1¾ in head; nasal barbels reach dorsal, maxillary surpass pectorals and extend to ventrals, mandibular extend to top of pectorals or nearly so and mental somewhat shorter; teeth small, sharply pointed, in 2 more or less confluent patches which very little curved and 4 times broad as long; mandibulary teeth in 2 contiguous quadrangular patches with posterior, exterior corner laterally produced; vomerine teeth in crescentic band;

head flat and granular above; occipital process very obtuse and very broad at base, very little prominent; frontal fontanel longer than occipital, its front border behind eyes; predorsal to occiput equals $\frac{1}{6}$ of space of latter to snout end. Gill rakers 15.

D. 68 to 72, and like anal may be united with base of rounded caudal; A. 52 to 61; pectoral rounded, conspicuously longer than head without snout, very strong spine $\frac{1}{4}$ shorter than longest rays, with 9 rays; ventral rays 6, rounded, reaches anal, about $\frac{2}{3}$ pectoral length.

Uniform blackish, underside of head and belly little lighter, sometimes with lighter spots. Length, 340 mm. (Weber and Beaufort.)

India, East Indies, Philippines, Siam, China.

Genus HETEROBRANCHUS Geoffroy Saint-Hilaire

Heterobranchus GEOFFROY SAINT HILAIRE, Descript. Egypte, Poiss., vol. 1, pl. 16, figs. 2–5, pl. 17, figs. 8, 9, 1809; text, p. 305, 1827. (Type, *Heterobranchus bidorsalis* Geoffroy Saint-Hilaire, monotypic.)

? *Encheloclarias* HERRE and MYERS, Raffles Mus. Bull. 13, p. 66, 1937. (Type *Heterobranchus tapeinopterus* Bleeker, orthotypic.)

Dorsal divided as anterior rayed fin and posterior adipose fin, latter supported by extensions of neural spines.

Except as diagnosed above like *Clarias*. With the exception of the species below all the others are African.

HETEROBRANCHUS TAPEINOPTERUS Bleeker

Heterobranchus tapeinopterus BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 732, 1852 (type locality: Province Toboali, in rivers, Banka); Atlas Ichth. Ind. Néerland., vol. 2, p. 101, pl. (49) 97, fig. 1, 1862 (Banka, Borneo).—GÜNTHER, Cat. Fishes British Mus., vol. 5, p. 22, 1864 (no locality).—ELERA, Cat. Fauna Filip., vol. 1, p. 566, 1895 (Samar).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 194, fig. 75, 1913 (compiled).

Encheloclarias tapeinopterus HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 66, 1937 (Mawai, Johore).

Depth 8 to $9\frac{1}{2}$; head to hind opercle end $5\frac{2}{3}$ to $6\frac{3}{4}$, long as wide. Eye 15 to 18 in head; nasal and mental barbels reach pectoral base, maxillary and mandibular barbels reach pectoral tip or beyond; small upper teeth in 2 juxtaposed patches, 2 patches in lower jaw in curved band; vomerine teeth in broad slightly curved band. Branchiostegals 8.

D. 24 to 27; adipose fin much lower but rather longer than rayed dorsal; caudal confluent with adipose fin and anal; pectoral little over 1 to $1\frac{1}{2}$ in head, spine distinctly serrate, rays 8; ventral rays 6.

Brownish. Length, 124 mm. (Weber and Beaufort.)

Banka, Borneo, British Malaya. Although reported from Samar by Elera this record needs confirmation.

Family PLOTOSIDAE

Body elongate, well compressed, tail tapering. Head depressed. Barbels 3 pairs, as maxillary, mandibular, and mental. Lateral fold at mouth corner may be extended as short barbel. Mouth subterminal. Teeth conic in jaws, sometimes absent above or mixed with molars below. Nostrils well separated, front pair usually tubular, either at front edge of upper lip directed up or forward or perforating lip and directed downward; hind nasal slit behind maxillary barbel. Lateral line more or less distinct, pores well separated. Postanal dendritic organ sometimes present, function apparently unknown. First dorsal above or behind pectoral origins, spine smooth or serrated on both front and hind edges. No adipose dorsal. Second dorsal long, with numerous rays and like anal joined with pointed caudal. Pectoral with sharp, pointed, barbed, strong or weak spine. Ventral rays 10 to 16.

Marine catfishes, though some living in estuaries or rivers. They are confined to the Indo-Pacific, largely when in the Pacific in its western portion.

ANALYSIS OF GENERA

a^1. Front nostril at front border of upper lip, directed upward or forward.
    b^1. Gill membranes free from isthmus; second dorsal origin behind ventral origin______________ **Plotosus**
    b^2. Gill membranes united to isthmus; second dorsal origin before or above ventral origin______________ **Cnidoglanis**
a^2. Front nostril perforates upper lip near its front border, directed downward; only front part of gill membranes confluent with isthmus; second dorsal origin before or above ventral origin______________ **Paraplotosus**

Genus PLOTOSUS Lacépède

Plotosus Lacépède, Hist. Nat. Poiss., vol. 5, p. 128, 1803. (Type, *Platystacus anguillaris* Bloch, monotypic.)

Plotosis Duméril, Zool. Analytique, p. 340, 1806. (Type, *Platystacus anguillaris* Bloch.)

Plotoseus Lesson, Voy. *Coquille*, Zool., vol. 2, pt. 1, p. 132, 1830. (Type, *Platystacus anguillaris* Bloch.)

Plotosius Schlegel, *in* Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 228, 1846. (Type, *Platystacus anguillaris* Bloch.)

Body elongate, robust forward, strongly compressed laterally, tail tapering. Head depressed, covered with thin skin, bluntly rounded in front. Eyes small, superolateral, not covered by skin. Mouth transverse. Thick lips covered with papillae or small folds. Jaws with 8 barbels, maxillary with but one pair. Conic teeth in upper jaw numerous, in mandible mixed with molars, on vomer molar like crescent. Nostrils far apart, anterior tubular, erect or directed forward. Gill openings wide, membranes free from isthmus. Gill rakers 28 to 30. Branchiostegals 9 to 13. Air vessel moderate, not enclosed in bone. Dorsals 2, first short, rays 4 or 5 and preceded by spine; second dorsal very long, inserted above or before ventrals, many rayed like anal and confluent with caudal. Pectoral spines toothed and like dorsal spine covered with soft skin. Ventral rays 12 to 14.

Indo-Pacific. Species few, living in the sea or if entering rivers seldom wandering above tidal influence. Their jagged spines are capable of causing severe wounds.

ANALYSIS OF SPECIES

a^1. Nasal barbel reaches beyond eye; band of lower jaw teeth in 3 to 5 rows.
  b^1. Dorsal rays 90; anal 82 ---------- abbreviatus
  b^2. Dorsal and anal rays over 100 ---------- canius
a^2. Nasal barbel not reaching beyond eye; band of lower jaw teeth in 2 or 3 rows; dorsal rays 80 to 100; anal 70 to 80 ---------- anguillaris

PLOTOSUS ABBREVIATUS Boulenger

Plotosus abbreviatus BOULENGER, Ann. Mag. Nat. Hist., ser. 6, vol. 15, p. 247, 1895 (type locality: Mouth of Baram River, Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 229, 1913 (type).

Depth 8; head 4½, width 1½. Eye 11 in head, 4 in interorbital; nasal barbel 1½, reaches preopercle, maxillary reaches opercle; upper teeth conic, in band 3 times long as wide, in 3 or 4 rows, anterior largest; large vomerine teeth molarlike, in large crescentic patch; lower teeth in broad band of 4 rows, molarlike, outer series large and obtusely conic.

D. I, 4; second D. 90; A. 82; caudal rays 18; pectoral spine little longer than dorsal, 2½ in head, rays 12; ventral rays 14.

Uniform dark olive above. Whitish beneath. Length, 420 mm. (Weber and Beaufort).

Borneo. Only known from the type in the British Museum.

PLOTOSUS CANIUS Buchanan-Hamilton

Plotosus canius BUCHANAN-HAMILTON, Fishes of Ganges, pp. 142, 374, pl. 26, fig. 45, 1822 (type locality: Rivers of southern Bengal).—VALENCIENNES, Hist. Nat. Poiss. vol. 15, p. 425, 1840 (copied).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 2, p. 99, pl. (48) 96, fig. 2, 1862 (Java, Madura, Singapore, Banka, Sumatra, Borneo, Celebes).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 5, p. 25, 1864 (Ganges, Calcutta, Pinang).—KNER, Reise *Novara*, Fische, p. 300, 1865.—DAY, Fishes of India, pt. 3, p. 482, pl. 112, fig. 3, 1877.—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 56, 1879 (Viti Islands).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, vol. 16, p. 167, 1880 (Borneo).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 41, 1885 (North Celebes).—DAY, Fauna British India, Fishes, vol. 1, p. 113, fig. 47, 1889.—ELERA, Cat. Fauna Filip., vol. 1, p. 565, 1895 (Cebu).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 461 (Baram River, Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 227, 1913 (Batavia, Deli, Baan Ahi Ahi, Kota Baru, Macassar, Pare Pare, Aru).—HORA, Journ. Nat.

Hist. Soc. Siam, vol. 6, p. 166, 1923 (Nontaburi); Mem. Asiatic Soc. Bengal, vol. 6, p. 467, 1924 (Tale Sap).—Herre, Philippine Journ. Sci., vol. 31, p. 390, 1926 (La Paz, Iloilo; Tacloban, Leyte).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 611, 1926 (Sarawak).—Fowler, Mem. Bishop Mus., vol. 10, p. 63, 1928 (compiled); vol. 11, p. 318, 1931 (reference).—Hardenberg, Treubia, vol. 13, livr. 1, p. 115, 1931 (Bagan Si Api Api).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 96, 1935 (Bangkok; Sriracha).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 46, 1937 (reference).—Suvatti, Index Fish. Siam, p. 67, 1937 (Samut Prakan; Bandon; Pakphun; Banghia; Maenam Canthaburi; Maklong; Chonburi; Laem Ngop).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 16, 1937 (Singapore).—Fowler, List Fish. Malaya, p. 45, 1938 (reference).

? *Plotosus limbatus* Valenciennes, Hist. Nat. Poiss., vol. 15, p. 422, 1840 (type locality: Hindostan).—Günther, Cat. Fishes British Mus., vol. 5, p. 25, 1864 (copied).

Plotosus unicolor (Kuhl and Van Hasselt) Valenciennes, Hist. Nat. Poiss., vol. 15, p. 426, 1840 (type locality: Java).

? *Plotosus macrocephalus* Valenciennes, Hist. Nat. Poiss., vol. 15, p. 428, pl. 449, 1840 (type locality: Timor).—Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 98, 1862 (copied).—Macleay, Proc. Linn. Soc. New South Wales, vol. 7, p. 592, 1883 (New Guinea).—Weber and Beaufort, Fishes Indo-Australian, Archipelago, vol. 2, p. 231, 1913 (copied; notes type lost).—Fowler, Mem. Bishop Mus., vol. 10, p. 63, 1928 (compiled).

Plotosus viviparus Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 182, 1846 (type locality: Java).

Plotosus horridus Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 183, 1846 (type locality: Java).

Plotosus multiradiatus Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 183, 1846 (type locality: Java).

Depth 7⅔; head 4⅔, width 1⅓ its length. Snout 2⅔ in head; eye 11, 4⅕ in snout, 3½ in interorbital; mouth width 2⅛ in head; lips and chin fleshy, papillate; teeth above conic, short, strong, mostly few slightly larger along front edge, in broad band; lower teeth large, mostly ground to appear as short cyclinders; crescentic band of large molars on vomer, of about 4 or 5 transverse series medially; nasal barbel reaches halfway in postocular region, maxillary to pectoral origin, outer mental ⅞ to pectoral origin, inner mental ⅗; interorbital 3¼ in head, broadly convex. Gill rakers 6+17, lanceolate, longest 1¾ in gill filaments, which equal twice eye diameter. Skin smooth.

D. I, 4 to about 115, first ray of first dorsal 2⅗ in head, height of second dorsal 3¼; A. 96, fin height 4⅓; caudal 13, joined with second dorsal and anal, length 3, convex behind; pectoral 2¼, smooth strong spine nearly ¾ fin length; ventral 3, rounded.

Back smoke gray to drab gray, below soiled cream buff. Iris dark gray. Barbels colored like back. Fins like back, first dorsal and pectorals darker.

India, British Malaya, Siam, East Indies, Polynesia?

1 example. A.N.S.P. Baram, Borneo. Wistar Institute of Anatomy. Length, 425 mm.

U.S.N.M. No. 47995. Cochinchina. Lyons Museum. Length, 333 mm.

PLOTOSUS ANGUILLARIS (Bloch)

Platystacus anguillaris Bloch, Naturg. ausländ. Fische, vol. 8, p. 61, pl. 373, fig. 1, 1794 (no locality, collection Herr John.)—Schneider, Syst. Ichth. Bloch, p. 373, pl. 74, 1801 (Tranquebar).—Shaw and Nodder, Nat. Misc., vol. 14, pl. 559, 1802 (Indian Seas).—Shaw, General zoology, vol. 5, p. 30, pl. 99, 1803.

Plotosus anguillaris Lacépède, Hist. Nat. Poiss., vol. 5, pp. 128, 130, pl. 3, fig. 2, 1803 (the Great Indies).—Cuvier, Règne animal, vol. 2, p. 297, 1817.—Rüppell, Neue Wirbelth., Fische, p. 76, 1835 (Tor).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1249, 1849 (Malayan Peninsula and Islands).—Peters, Arch. Naturg., p. 267, 1855 (Mozambique).—Schmeltz, Cat. Mus. Godeffroy, No. 1, p. 10, 1864 (South Seas).—Günther, Cat. Fishes British Mus., vol. 5, p. 24, 1864 (Pinang; types of *Plotosus marginatus*, Borneo, East Indies, Amoy, China, Philippines, Fiji, Moreton Bay).—Schmeltz, Cat. Mus. Godeffroy, No. 4, p. 24, 1869 (Kandavu; Pelew Islands).—Macleay, Proc. Linn. Soc. New South Wales, vol. 2, p. 363, 1878 (Port Darwin).—Schmeltz, Cat. Mus. Godeffroy, No. 7, p. 56, 1879 (Kandavu; Pelew Islands).—Károli, Termesz. Füzetek, Budapest, vol. 5, p. 177, 1881 (Siam).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 203, 1881 (Moreton Bay, Endeavour River, Port Darwin); Proc. Linn. Soc. New South Wales, vol. 8, p. 276, 1883 (Hood Bay, New Guinea).—Pöhl, Cat. Mus. Godeffroy, No. 9, p. 38, 1884 (Pelew Islands).—Meyer, Anal. Soc. Españ. Hist. Nat. Madrid, vol. 14, p. 41, 1885 (North Celebes; Manila Bay).—Steindachner and Döderlein, Denkschr. Akad. Wiss. Wien, math. nat. Kl., vol. 53, p. 287, 1887 (Tokyo, Enoshima, Inland Sea, Kagoshima).—Ogilby, Mem. Austral. Mus., vol. 2, p. 71, 1889 (Lord Howe Island).—Sauvage, Hist. Nat. Madagascar, Poiss., p. 477, pl. 47A, fig. 1, 1891.—Elera, Cat. Fauna Filip., vol. 1, p. 566, 1895 (Luzon, Manila Bay, Nasugbu, Batangas, Cebu, Samar).—Pfeffer, Thierw. Ost Afrika, Fische, p. 29, fig., 1896.—Ishikawa and Matsuura, Prelim. Cat. Fishes Mus. Tokyo, p. 24, 1897.—Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 320, 1902 (Giran, Formosa).—Jordan and Fowler, Proc. U. S. Nat. Mus., vol. 26, p. 898, 1903 (Tokyo, Misaki, Wakanoura, Mogi, Nagasaki).—Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang).—Waite, Rec. Australian Mus., vol. 5, pt. 3, p. 141, 1904 (Lord Howe Island).—Seale, Occ. Pap. Bishop Mus., vol. 4, No. 1, p. 12, 1906 (Shortland Island).—Jordan and Seale, Bull. Bur. Fisher., vol. 25, 1905, p. 191, 1906 (Apia).—Jordan and Dickerson, Proc. U. S. Nat. Mus., vol. 34, p. 604, 1906 (Suva, Fiji).—Jordan and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 8, 1907 (Manila).—Evermann and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 56, 1907 (Bacon).—Seale and Bean, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).—Jordan and Richardson, Bull. Bur. Fisher., vol. 27 (1907), p. 242, 1908 (Cuyo).—Günther, Journ. Mus. Godeffroy. pt. 16, p. 372, 1909 (Solomons, Fiji, Samoa, Tonga, Society, Kingsmills Islands).—Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 168, 1909 (Takao).—Boulenger, Cat. Fresh Water Fishes Africa, vol. 2, p. 278, fig. 229, 1911 (Gulf of Suez, Zanzibar, Rodriguez).—Zugmayer, Abh. Bayer. Akad. Wiss. math.-phys. Kl., vol. 26, p. 9, 1913 (Oman).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 229, 1913 (Batavia, Blitok, Deli, Balikpapan, Kota Baru, Lombok, Ambon, Kei, Aru).—Beaufort, Bijdr. Dierk., Amsterdam, pt. 19, p. 98, 1913 (Saonek, Sorong).—Jordan, Tanaka, Snyder, Journ. College Sci. Tokyo, vol. 33, p. 57, 1913 (reference).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1915, p. 225 (Padang, Singapore, Apia, Bacon).—Bamber, Journ. Linn. Soc. London, vol. 31, Zool., p. 478, 1915 (Red Sea).—Izuka and Matsuura, Cat. Zool. Spec., Tokyo Mus. Vertebrata, p. 179, 1920 (Misaki).—Fowler and Bean, Proc. U. S. Nat. Mus., vol. 62, p. 3, 1922 (Cebu).—Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 163, 1925 (East London, Natal).—Fowler, Bishop Mus. Bull. 22, p. 31, 1925 (Samoa).—Herre, Philippine Journ. Sci., vol. 31, p. 391, 1926 (Puerto Galera, San Miguel Bay, Bacon, Iloilo, Estancia, Siquijor, Bantayan, Cabalian, Busuanga, Culion, Dinagat, Camiguin, Caldera Bay, Zamboanga, Davao, Samal, Jolo, Pearl Bank, Sitanki, Sibutu, Japan, Amoy, Hongkong, Sandakan, Lord Howe Island).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 260, 1927 (Bacon).—McCulloch, Fishes of New South Wales, ed. 2, p. 21, pl. 7, fig. 70a, 1927.—Fowler, Mem. Bishop Mus., vol. 10, p. 62, 1928 (Shortland, New Guinea, Pacific, Tongatabu, Fiji ? Apia).—Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 53, fig. 43, 1929 (Amoy).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 602 (Hongkong).—Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 53, fig. 43, 1929 (Amoy).—Schmidt, Bull. Acad. Sci. U.R.S.S., p. 104, 1930 (Nagasaki; Obama); Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 24, 1931 (Nagasaki).—Tanaka, Jap. Fish. Life Colours, No. 67, 1933.—Herre, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 7, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 23, 1934 (Culion; Dumaguete; Sitanki).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 417, 1934 (Natal); vol. 87, p. 369, 1935 (Natal).—Tortonese, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, p. 15, 1935–36 (Mar Rosso; Massaua).—Suvatti, Index Fish. Siam, p. 66, 1937 (Songkhla; Chumphon; Samut Prakan; Canthaburi; Thale Sap; Pakphum; Samut Sakhon Bay; Sriracha).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 133, fig. 4, 1937 (Paknam).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 16, 1937 (Singapore).—Fowler, List Fish. Malaya, p. 45 (247), 1938 (reference).

Plotosus ikapor Lesson, Dict. Classique Hist. Nat., vol. 15, p. 435, 1929 (type locality: Offack Bay, Waigiu).

Plotosus ikapor Lesson, Voy. *Coquille*, Zool., vol. 28, pt. 1, p. 132, pl. 31, fig. 3, 1830 (type).

Plotosus marginatus Bennett, Life of Raffles, p. 691, 1830 (type locality: Sumatra).

Plotosus vittatus Swainson, Nat. Hist. Animals, vol. 2, p. 307, 1839 (on Bloch).

Plotoseus lineatus Valenciennes, Hist. Nat. Poiss., vol. 15, p. 412, 1840 (type locality: Red Sea, Seychelles, Malabar, Mauritius, Trinquemale, Pondicherry, Amboina, Celebes, Friendly Islands, Tahiti, Macao, Philippines).—Schlegel, *in* Siebold's Fauna Japonica, Poiss. pts. 10–14, p. 228, pl. 104, fig. 3, 1846 (Nagasaki Bay).—Richardson, Ichth. China Japan, p. 286, 1846 (Seas of China; Macao).—Thiollière, Fauna Woodlark, p. 203, 1857 (Woodlark Island).

Plotosus castaneus Valenciennes, Hist. Nat. Poiss., vol. 15, p. 421, 1840 (type locality: Mahé).

Plotosus castaneoides Bleeker, Nat. Tijds. Nederland. Indië, vol. 2, p. 490, 1851 (type locality: Rio).

Plotosus arab Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 98, pl. (47) 95, fig. 2, 1862 (type locality: Java, Sumatra, Batu, Nias, Bintang, Banka, Celebes, Sangi, Batjan, Buro, Amboina, Ceram).—Kner, Reise *Novara*, Fische, p. 300, 1865 (Singapore).—Day, Fishes of Malabar, p. 195, 1865.—Bleeker, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 300, 1868 (Waigiu).—Klunzinger, Verh. Zool.-bot. Ges. Wien, vol. 21, p. 588, 1871 (Red Sea).—Day, Fishes of India, pt. 3, p. 483, pl. 112, fig. 4, 1877.—Bleeker, Arch. Néerland. Sci. Nat., vol. 13, p. 38, 1878 (New Guinea).—Day, Fauna Brit. India, Fishes, vol. 1, p. 113, 1889.—Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 23, p. 340, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 44, 1901 (Yokohama).—Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 115, pt. 1, p. 1420, 1906 (Apia).—Zugmayer, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 9, 1913 (Mekran).—Seale, Philippine Journ. Sci., vol. 9, p. 60, 1914 (Hongkong).

Plotosus canius (not Buchanan-Hamilton) Schmeltz, Cat. Mus. Godeffroy, No. 4, p. 24, 1869 (Viti Islands); No. 5, p. 35, 1874 (Ovalu).—Bleeker, Nederland. Tijdschr. Dierk., vol. 4, p. 116, 1874 (China).

? *Plotosus laticeps* Kent, Great Barrier Reef, p. 370, 1893 (type locality: Queensland). (Name only).

Plotosus papuensis Weber, Notes Leyden Mus., vol. 32, p. 228, 1910 (type locality: Lorentz River, South New Guinea); Nova Guinea, vol. 9, p. 520, fig. 2, 1913 (Lorentz River at Wellskamp, Sabang, Alkman, Riverkamp, Bivak Island).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 228, 1913 (fig. 91, p. 227) (types).

Depth 6¼ to 7½; head 4⅛ to 4½, width 1⅗ to 1½. Snout 2½ to 2⅔ in head; eye 5½ to 7, 2¾ to 3 in snout, eye 2⅞ to 3 in interorbital; mouth width 2⅕ to 2⅗ in head; lips thick, papillose; nasal barbel ⅔ or to eye, maxillary to eye center or beyond, outer mental to or beyond eye, inner mental to eye; jaws each with 2 irregular series of teeth merging as single row each side or laterally, sometimes 3 series in front of lower jaw; crescentic band of molarlike teeth on vomer in 2 or 3 series; interorbital 2¾ to 3¼ in head, but little elevated, depressed or flattened medially. Gill rakers 8+23 or 24, lanceolate, equal gill filaments or eye.

Skin smooth.

D. I, 4 or 5, first ray 2½ to 2⅗ in head, spine 2¾; second D. 82 to 85; A. 62 ? to 72; caudal 2⅔ to 3¼ in head; pectoral 1½ to 2; ventral 2 to 2⅛.

Uniform brownish, vertical fins with blackish edges. Young with white longitudinal line from side of snout tip along each side of tail to caudal. Also another white line, parallel, from each maxillary end along middle of side of head below eye and fading out posteriorly or reaching hind end of tail.

Red Sea, Arabia, Zanzibar, Natal, South Africa, Madagascar, Rodriguez, Mauritius, Seychelles, India, Ceylon, Andamans, Pinang, Malay Peninsula, Siam, East Indies, Philippines, China, Formosa, Japan, North Australia, Queensland, Melanesia, Micronesia, Polynesia.

22091. Abuyog, Leyte. July 26, 1909. Length, 90–95 mm. 4 examples.

4 examples. Bagacay Bay, Escarpada Island. March 13, 1909. Length, 94–114 mm.

20490. Batan Island. June 5, 1909. Length, 136 mm.

20348. Buena Vista, Guimares Island. January 14, 1909. Length, 145 mm. Uniform brown.

16 examples. Candaraman Island, Balabac. January 4, 1909. Length, 82–94 mm.

20383, 20384. Catbalogan, Samar. April 10, 1908. Length, 125–136 mm.

6 examples. Catbalogan. April 16, 1908. Length, 43 or 44 mm.

1 example. Cebu market. March 28, 1909. Length, 29 mm.

10523. Cebu market. August 17, 1909. Length, 34 mm.

1 example. Cebu market. September 3, 1909. Length, 30 mm.

22879. Davao, Mindanao. May 16, 1908. Length, 151 mm.

5 examples. Grande Island Reef. January 8, 1908. Length, 58–60 mm.

16 examples. Jolo, shore seine. March 6, 1908. Length, 15–18 mm.

5 examples. Jolo. March 6 or 7, 1908. Length, 72–142 mm.

18579. Malanipa Island. September 8, 1909. Length, 200 mm.

8649 to 8662. Manila harbor. January 13, 1908. Length, 138–199 mm.

2 examples. Matalvi, Luzon. November 23, 1908. Length, 31–33 mm.

14 examples. Pandanon Island, March 23, 1909. Length, 15 or 16 mm.

14 examples. Pandanon Island. March 24, 1909. Length, 26–28 mm.

3 examples. Papatag Island, Tawi Tawi Group. February 23, 1909. Length, 31–53 mm.

259 examples. Port Matalvi, Luzon. November 23, 1908. Length, 23–33 mm.

19 examples. Romblon Harbor. March 25, 1908. Length, 43–47 mm.

1 example. San Miguel Harbor, Ticao Island. April 21, 1908. Length, 35 mm.

16261, 16262, 16470. Teomabal Island. September 18, 1909. Length, 51–70 mm.

11737, 19325, 20229. Sandakan market, Borneo. March 2, 1908. Length, 146–209 mm.

U.S.N.M. No. 12613. Madras. British Museum. Length, 133–145 mm. 2 examples.

U.S.N.M. No. 30625. New Guinea. Australian Museum. Length, 184–207 mm. 2 examples.

U.S.N.M. No. 34463. Hong Kong, China. J. C. Brevoort. Length, 120–139 mm. 3 examples.

U.S.N.M. No. 52303. Apia, Samoa. Bureau of Fisheries. Length, 70–200 mm. 4 examples.

U.S.N.M. No. 56267. Bacon, Philippines. Bureau of Fisheries 4031. Length, 38–40 mm. 4 examples.

U.S.N.M. No. 56281. Jolo (342). Bureau of Fisheries. Length, 155 mm. Bacon (3368 and 4034). Length, 142 and 170 mm.

U.S.N.M. No. 56298. Manila. G. A. Lung. Length, 86–146 mm. 8 examples.

U.S.N.M. No. 58057. Zamboanga. August 1–10, 1906. Dr. E. A. Mearns. Length, 38–238 mm. 750 examples.

U.S.N.M. No. 58995. Bacon, Philippines. Bureau of Fisheries (4031). Length, 37–42 mm. 5 examples.

U.S.N.M. No. 58998. Bacon, Bureau of Fisheries (3176 and 3177). Length, 140 mm. 2 examples.

U.S.N.M. No. 59776. Kagoshima, Japan. Dr. H. M. Smith. Length, 197–210 mm. 2 examples.

U.S.N.M. No. 71984. Misaki, Japan. *Albatross* collection. Length, 25–197 mm. 109 examples. Brownish black, lighter and tinged golden below. Stripes golden yellow. Fins golden, tinted brown.

No. 71970 U.S.N.M. Tanegashima Island. *Albatross* collection 1906. Length, 61–130 mm. 31 examples.

No. 76542 U.S.N.M. Karuizawa, Japan. August 1914. Dr. Fred Baker. Length, 172–184 mm. 3 examples.

No. 79265 to 79267 U.S.N.M. Philippines. E. H. Taylor. Length, 160–240 mm. 3 examples.

No. 84211 U.S.N.M. Philippine Islands. Dr. Fred Baker. Length, 130 mm.

No. 84246 U.S.N.M. Philippine Islands. Dr. Fred Baker. Length, 33–47 mm. 33 examples.

Genus CNIDOGLANIS Günther

Cnidoglanis Günther, Cat. Fishes British Mus., vol. 5, p. 27, 1864. (Type, *Plotosus megastomus* Richardson, designated by Jordan, Genera of Fishes, pt. 3, p. 332, 1919.)

Body elongate, tail tapering. Head depressed. Eye small, covered with skin. Mouth cleft transverse, rounded in front. Lips thick, papillose, upper prominent. Barbels 8. Upper jaw teeth conic, mixed in lower jaw, vomerine molarlike. Front nostril on front edge of upper lip, directed upward. Hind nostril just behind nasal barbel. Gill membranes united below throat and joined with isthmus along entire median line. Second and third branchial arches with series of long cartilaginous processes covering bases of all laminae on sides facing each other. Front dorsal short, with pungent spine, inserted above or behind pectoral origin. Second dorsal long, confluent like anal with caudal, which pointed behind. Pectoral with denticulated spine. Ventral rays 10 to 13.

CNIDOGLANIS NUDICEPS Günther

Cnidoglanis nudiceps Günther, Rep. Voy. *Challenger*, vol. 1, pt. 8, p. 49, 1883 (type locality: Arafura Sea).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 232, fig. 92, 1913 (type).—Fowler, Mem. Bishop Mus., vol. 10, p. 63, 1928 (compiled).

Depth 11; head 7, long as trunk to vent. Snout 2¾ in head; eye 5½, 2⅛ in snout; nasal barbel reaches 1¾ to gill opening, maxillary reaches halfway, mandibular and mental subequal or 1¼ in snout; lower lip not pendant or fringed, lateral fold at mouth corner not produced in barbel; maxillary teeth conical, in 2 small partly triangular patches; mandibular teeth in band; vomerine teeth more obtuse, in 2 series forming subcrescentic band; occipital region osseous, not covered with loose skin. Isthmus broader than interorbital. Branchiostegals 7.

First dorsal lower than body, begins about eye diameter behind gill opening, spine serrated in front and behind, 2⅓ in head to hind opercle edge, fin height 2; caudal length 2$\frac{1}{10}$; pectoral 2; ventral 2½.

Light brownish. Fins with black margin. Length, 240 mm. (Weber and Beaufort.)

Arafura Sea. The type, in the British museum, is the only specimen known.

Genus PARAPLOTOSUS Bleeker

Paraplotosus Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 100, 1862. (Type, *Plotosus albilabris* Valenciennes, monotypic.)

Body elongate, tail tapering. Head depressed. Eye not covered by skin. Mouth transverse, rounded in front. Lips with close-set papillae and vermiculated folds, upper very prominent. Maxillary barbel near end of upper lip, mandibulary barbel below mouth corner, 2 mental barbels between mandibulary barbels, nasal barbel before hind nostril. Upper jaw teeth in 2 rhombic patches with rounded lateral edges, conical with rounded tops, median strongest. Lower teeth in 2 close-set partly crescentic areas, anterior row strong and conic, posterior molars and mesially in 4 rows. Vomerine teeth molar, in crescentic patch, 4 rows transversely in middle with posterior strongest. Front nostril perforates upper lip near its front border, directed downward. Hind nostril slit between eye and upper lip. Gill membranes joined medially, only front part of confluent portion joined with isthmus. Gill rakers 22 on entire arch. Second and third branchial arches with series of long cartilaginous rods covering bases of gill filaments on sides facing each other. Branchiostegals 9 to 11. First dorsal short, behind pectoral origin, with few rays and strong spine, denticulate on both edges. Second dorsal origin before or above ventral origin, rays numerous, like anal confluent with caudal. Pectoral with denticulate spine. Ventral rays 12 or 13. Conspicuous dendritic organ behind vent.

PARAPLOTOSUS ALBILABRIS (Valenciennes)

Plotosus albilabris Valenciennes, Hist. Nat. Poiss., vol. 15, p. 427, 1840 (type locality: Java, Batavia).—Cantor, Journ. Asiat. Soc. Bengal, vol. 18, p. 1247, 1849 (Pinang, Malay Peninsula).—Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 99, pl. (48) 96, fig. 1, 1862 (Java, Bintang, Biliton, Singapore, Celebes).

Copidoglanis albilabris Günther, Cat. Fishes British Mus., vol. 5, p. 26, 1864 (Pinang).

Paraplotosus albilabris Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 225, fig. 90, 1913 (Singapore, Aru, Sorong, New Guinea).—Beaufort, Bijdr. Dierk., Amsterdam, vol. 19, p. 96, 1913 (Sorong).—Herre, Philippine Journ. Sci., vol. 31, p. 338, 1926 (Culion, Sitanki, Bantayan, Jolo).—Fowler, Mem. Bishop Mus., vol. 10, p. 63, 1928 (compiled).—Herre, Fishes Herre Philippine Exped. 1931, p. 22, 1934 (Culion; Sitanki).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 46, 1937 (reference).—Herre and Myers, Raffles Mus. Bull., No. 13, p. 16, 1937 (Singapore).—Fowler, List Fish. Malaya, p. 45, 1938 (reference).

Plotosus macrophthalmus Bleeker, Verh. Batav. Genootsch. (Sil. Batav. Consp.), vol. 21, pp. 565, 179, 1867 (type locality: Batavia).

Depth 6⅔ to 7⅖; head 4¾ to 5⅖, width 1⅓ to 1⅔. Snout 2⅖ to 2⅗ in head; eye 4⅔ to 5⅔, 1⅘ to 2⅓ in snout, 1$\frac{1}{10}$ to 1½ in interorbital; nasal barbel 1⅓ to 1¾ in head, maxillary and mental 2, mandibular 1⅗ to 1⅘; front row of maxillary teeth long, stout, conic, others similar but smaller; lower jaw teeth in separated patches, form crescentic band of 4 rows merging to 1 row posteriorly, outer row longest of large conic teeth with rounded tips, others molariform and posterior row largest, short, broad, flat topped; vomerine teeth coarse, rounded, hind or fourth row very large, molariform. Gill rakers 6+7.

First dorsal I, 4 or 5, length 1½ to 1⅗ in head, strong spine smooth or toothed and 2½ to 2⅗; second dorsal 95 to 110, high, thick and fleshy in front third; A. 90 to 100, little lower than second dorsal; pectoral equals first dorsal height, stout spine smooth or barbed before and behind, almost equals first dorsal spine, rays 12 or 13; ventral 1⅘ to 2 in head, extend upon anal, rays 12 or 13.

Uniform chocolate brown. Underside of head and belly brown to white. Lips white. Fins darker to blackish. Length, 265 mm. (Herre.)

Pinang, Malay Peninsula, Singapore, East Indies, Philippines. According to Bleeker reaches 353 mm.

Family TACHYSURIDAE

Body moderately long. Head conic or depressed, with conspicuous bony plates above which may be covered with skin. Eyes usually with free lids, subcutaneous sometimes. Mouth large or small, transverse or crescentic, usually terminally inferior. Maxillary, mandibular, and mental barbels usually present, sometimes only maxillary or mandibular present. Teeth in jaws villiform, conic or incisorlike, in 1 or more rows or in bands or patches; palate with or without teeth, which villiform, conic or granular. Nostrils close together, posterior with valve but without barbel. Gill membranes united and joined with or form low fold on isthmus. Branchiostegals 5 to 9. Vertebrae 48 to 58, of which 27 to 33 caudal. Air bladder large, free, normal. Dorsal fin short, with long sharp spine and 7 rays, advanced between paired fins. Anal rays 14 to 26. Adipose fin shorter than dorsal, opposite anal. Caudal deeply forked. Pectoral low, with strong spine. Ventral rays 6.

A large group, marine or living about the mouths of rivers, lagoons, bays, and rivers in tidal waters. The species are all very similar in a general way, frequently difficult to distinguish, owing to their variable coloration as well as structural characters. The form of the bands or patches of teeth in the jaws and on the palate have been used to group the species into subgenera and genera. They vary greatly with age, the areas far more developed in older examples. Without extensive series of materials it is often difficult to use these characters except as basic specific divisions.

A number of the species carry their eggs about in the mouth until hatched. Others build nests in streams.

ANALYSIS OF GENERA

*a*¹. Teeth present on palate.
  *b*¹. Maxillary and mental barbels present------------------------ **Tachysurus**
  *b*². Only a pair of stiff osseous maxillary barbels present------ **Osteogeneiosus**
*a*². No teeth on palate-- **Hemipimelodus**

Genus TACHYSURUS Lacépède

Tachysurus Lacépède, Hist. Nat. Poiss., vol. 5, p. 150, 1803. (Type, *Tachysurus sinensis* Lacépède, monotypic).

Galeichthys Valenciennes, Hist. Nat. Poiss., vol. 15, p. 28, 1840. (Type, *Galeichthys feliceps* Valenciennes, designated by Bleeker, Nederland. Tijdschr. Dierk., vol. 1, p. 90, 1863).

Arius Valenciennes, Hist. Nat. Poiss., vol. 15, p. 53, 1840. (Type, *Pimelodus arius* Buchanan-Hamilton, tautotypic.)

Sciades Müller and Troschel, Horae Ichth., pt. 3, p. 6, 1849. (Type, *Bagrus* (*Sciades*) *pictus* Müller and Troschel.)

Ariodes Müller and Troschel, Horae Ichth., pt. 3, p. 6, 1849. (Type, *Bagrus* (*Arius*) *arenarius* Müller and Troschel.)

Hexanematichthys Bleeker, Ichth. Arch. Ind. Prodr., vol. 1, Siluri, pp. 61, 126, 1858. (Type, *Bagrus sondaicus* Bleeker, monotypic.)

Selenaspis Bleeker, Ichth. Arch. Ind. Prodr., vol. 1, Siluri, pp. 62, 66, 1858. (Type, *Silurus herzbergii* Bloch.)

Cephalocassis Bleeker, Ichth. Arch. Ind. Prodr., vol. 1, Siluri, pp. 62, 92, 1858. (Type, *Arius melanochir* Bleeker, designated by Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 7, 1862.)

Netuma Bleeker, Ichth. Arch. Ind. Prodr., vol. 1, Siluri, pp. 62, 93, 1858. (Type, *Bagrus thalassinus* Rüppell.)

Guiritinga Bleeker, Ichth. Arch. Ind. Prodr., vol. 1, Siluri, pp. 62, 67, 1858. (Type, *Pimelodus commersonii* Lacépède.)

Sciadeichthys Bleeker, Ichth. Arch. Ind. Prodr., vol. 1, Siluri, pp. 62, 66, 99, 1858. (Type *Bagrus* (*Sciades*) *pictus* Müller and Troschel.)

Ariopsis Gill, Proc. Acad. Nat. Sci. Philadelphia (Fishes East Coast), p. 56, 1861. (Type, *Arius milberti* Valenciennes=*Silurus felis* Linnaeus.)

Sarcogenys (Kuhl and Van Hasselt) Bleeker (not Gray, 1855, in birds), Atlas Ichth. Ind. Néerland., vol. 2, p. 28, 1862. (Type, *Sarcogenys rostratus* (Kuhl and Van Hasselt) Bleeker=*Bagrus thalassinus* Rüppell, monotypic.)

Catastoma (Kuhl and Van Hasselt) Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 28, 1862. (Type, *Catastoma nasutum* (Kuhl and Van Hasselt) Bleeker=*Bagrus thalassinus* Rüppell, monotypic.) (*Catostoma* Wagler, 1830, in reptiles not involved.)

Hemiarius Bleeker, Ned. Tijdschr. Dierk., vol. 1, p. 90, 1863. (Type, *Cephalocassis stormi* Bleeker.)

Leptarius Gill, Proc. Acad. Nat. Sci. Philadelphia, 1863, p. 170. (Type, *Leptarius dowii* Gill, monotypic.)

Notarius Gill, Proc. Acad. Nat. Sci. Philadelphia, 1863, p. 171. (Type, *Arius grandicassis* Valenciennes, monotypic.)

Pseudarius Bleeker, Nederland. Tijdschr. Dierk., vol. 1, p. 91, 1863. (Type, *Arius arius* Valenciennes, orthotypic.)

Cathorops Jordan and Gilbert, Bull. U. S. Fish Comm., vol. 11, p. 39, 1882. (Type, *Arius hypophthalmus* Steindachner.)

Cinetodus Ogilby, Proc. Linn. Soc. New South Wales, vol. 23, p. 32, 1898. (Type, *Arius froggatii* Ramsay and Ogilby.)

Nemapteryx Ogilby, Ann. Queensland Mus., No. 9, p. 10, 1908. (Type, *Arius stirlingi* Ogilby.)

Body elongate. Eye largely free. Mouth moderate, upper jaw longer. Barbels 6, close together, usually short maxillary pair terete or compressed. Teeth in villiform bands in jaws. Vomer with 1 or 2 patches of granular teeth, also palatines sometimes confluent as one band. Skull with fontanel. Dorsal buckler sparingly granular. Skin smooth, naked, on occipital nuchal region covering bony bucklers. Dorsal fin short, before ventrals, with pungent spine and 7 rays. Adipose fin well developed, free behind. Anal short. Caudal deeply forked. Pectoral with spine. Ventral rays 6.

Marine catfishes, with numerous species on sandy tropical shores, but not about coral reefs. Many of the species have been set apart for generic distinction, though for the present those belonging in the old group called *Arius* are here assembled under the earlier name of *Tachysurus*.

ANALYSIS OF SPECIES

a^1. Teeth on palate villiform, conic or pointed.
b^1. TACHYSURUS. Teeth in one group on each side of palate.
c^1. Head shields granular.
d^1. Pectoral spine longer than dorsal spine.
e^1. Palatine teeth strong, coarse, conic, with pointed ends, in 2 small ovate-triangular widely separated patches ---------------- dispar
e^2. Palatine teeth villiform, with 2 large nearly equilateral patches. maculatus
d^2. Pectoral spine shorter than dorsal spine; palatine teeth villiform, in 2 widely separated triangular patches, anterior rounded base longer than their height ---------------- caelatus
c^2. Head shields smooth or nearly so; pectoral spine long as dorsal spine. venosus
b^2. HEXANEMATICHTHYS. Teeth in 2 groups on each side in a transverse row on palatines.
f^1. Outer palatine groups rounded or oval, larger than inner groups, which generally distant; occipital process hemispherically rounded ---------------- sagor
f^2. Outer palatine groups triangular, with emarginate hind edge, greatly exceed in size very small contiguous inner groups; occipital process triangular ---------------- sona
b^3. NETUMA. Teeth in 3 groups on each side on palate, forming large triangular patch with base anteriorly ---------------- thalassinus

a^2. Teeth on palate granular.
- g^1. PSEUDARIUS. Palatine teeth in 2 groups, begin at front edge of palate and cover most its front surface, patches wider anteriorly; gill rakers 12------------------------- manillensis
- g^2. ARIODES. Palatine teeth in 4 groups.
  - h^1. Hind patches in broad oval or ellipse, converge behind or parallel.
    - i^1. Anterior patches well developed.
      - j^1. Forward patches ovate-elliptical, far apart, each of 16 to 26 or more teeth; length parallel to front palate edge; hind patches far back, elliptical, usually parallel; occipital process truncate triangle with nearly straight sides; gill rakers 12-------------------- magatensis
      - j^2. Forward patches ovate, nearly at right angles to anterior palatal edge; hind patches pear-shaped, converging behind; occipital process triangular, elevated along center, sides convex; gill rakers 9-------------- crossocheilus
    - i^2. Anterior patches very small or rudimentary; occipital process with straight sides; gill rakers 7 or 8---- argyropleuron
  - h^2. Hind patches elongate or in narrow oval, end at rear in diverging points.
    - k^1. Occipital process ovate or oval, large, elevated, with convoluted rough surface; gill rakers 8 or 9. leiotetocephalus
    - k^2. Occipital process triangulate, with straight sides; surface radially granulate; gill rakers 12---- goniaspis

Subgenus TACHYSURUS Lacépède

TACHYSURUS DISPAR (Herre)

Arius dispar HERRE, Philippine Journ. Sci., vol. 31, p. 405, pl. 1, fig. 6 (dentition) 1926 (type locality: Paco market, Manila; Leguna de Bay; Pasig River; Quiapo market, Manila; Los Baños); Fish. Herre Philippine Exped. 1931, p. 22, 1934 (San Fabian; Augat R.; Manila; Leguna de Bay; Pasig R.).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 44, 1937 (reference).

Depth 5⅓; head 3¼, width 1½. Snout projects beyond lower lip, broadly rounded; eye 7⅓ in head, 2⅔ in snout, 3⅕ in interorbital; maxillary barbel reaches pectoral base, mandibular reaches gill opening, 1¼ in maxillary, mental much shorter; teeth villiform, in slightly curved band, widest at ends, width 5 in its length; lower teeth slightly longer, crescentic band much narrower; on palate 2 small, very widely separate, ovate, triangular patches of coarse strong conic teeth; plates on top of head granulose, with broad median fontanel from opposite nostril to occipital process; last bluntly triangulate, sides slightly bowed, densely granulate, hind blunt edge in contact with narrow crescentic, granulose bone at base of dorsal spine; humeral plate small, sharply triangulate, smooth. Gill rakers 7+12, stiff, twice eye.

Dorsal fin 1⅓ in head, spine 1¾, front edge granulose, serrate near tip and serrate behind; adipose fin base 1¾ in anal base; A. 18;

caudal deeply notched, upper lobe longer or 3 times middle rays; pectoral 1⅖ in head, spine flattened, smooth on basal half, serrate on upper half on both edges, 1⅔ in head.

Blackish brown above, with metallic sheen on sides, passing to bright silvery below lateral line. Lower and under part of trunk and under side of head whitish. Dorsal blackish, lower half of adipose fin deep red brown by transmitted light, blackish brown as viewed directly. Caudal pale brown, clear posteriorly. Upper side of pectoral dusky, under side and both sides of ventrals white. Length, 340 mm. (Herre.)

Philippines. Herre says its elongate snout and thick lips render it noticeable when seen among the common catfishes of Laguna de Bay. He also notes great mortality in November 1925 at Manila, due to flagellate protozoans.

TACHYSURUS MACULATUS (Thunberg)

Silurus maculatus Thunberg, Kon. Vet. Akad. Nya Handl. Stockholm, vol. 13, p. 31, pl. 1, fig. 2 (2 figs.), 1792 (type locality: Japan).

Arius maculatus Hardenberg, Treubia, vol. 12, livr. 1, p. 116, 1931 (Bagan Si Api Api).

Tachysurus maculatus Fowler, List Fish. Malaya, p. 50, 1938 (reference).

Tachysurus sinensis Lacépède, Hist. Nat. Poiss., vol. 5, pp. 150, 151, pl. 5, fig. 2, 1803 (type locality: None=on Chinese painting).—Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 57 (Swatow).—Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 321, 1902 (Formosa, Suwata).—Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 168, 1909 (copied).—Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 601 (Hong Kong).

Arius sinensis Valenciennes, Hist. Nat. Poiss., vol. 15, p. 72, 1840 (Touraine).—Richardson, Ichth. China Japan, p. 284, 1846 (copied).—Günther, Cat. Fish. Brit. Mus., vol. 5, p. 159, 1864 (copied).—Sauvage and DeThiersant, Ann. Sci. Nat., ser. 6, vol. 1, Zool., p. 7, 1874 (China).

? *Arius arius* Valenciennes, Hist. Nat. Poiss., vol. 15, p. 102, 1840 (type locality: Pondicherry).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 56, 1853 (reference).

Pimelodus tachisurus Valenciennes, Hist. Nat. Poiss., vol. 15, p. 163, 1840 (on Lacépède).—Richardson, Ichth. China Japan, p. 286, 1846 (China).

Arius falcarius Richardson, Voy. *Sulphur*, Ichth., p. 134, pl. 62, figs. 7–9, 1844 (type locality: China); Ichth. China Japan, p. 284, 1846 (Canton).—Günther, Cat. Fishes British Mus., vol. 5, p. 168, fig. (teeth and occiput), 1864 (Formosa, China, Canton, Amoy, type of *Arius falcarius*); Fishes of Zanzibar, p. 114, 1866.—Sauvage and DeThiersant, Ann. Sci. Nat., ser. 6, vol. 1, Zool., p. 7, 1874 (China).—Day, Fishes of India, pt. 3, p. 463, pl. 106, fig. 5, 1877; Fauna British India, Fishes, vol. 1, p. 182, 1889.—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 9, 1889, p. 240, 1890 (Rangoon).—Elera, Cat. Fauna Filip., vol. 1, p. 571, 1895 (Luzon, Laguna de Bay).—Bartlett, Sarawak Gazette, vol. 26, No. 368, p. 182, 1896 (Moratabas).—Seale, Philippine Journ. Sci., vol. 9, p. 60, 1914 (Hong Kong).—Wu, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 50, fig. 41, 1929 (Amoy).

Tachysurus falcarius Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 25, p. 321, 1902 (Suwata, Formosa).—Jordan and Richardson, Mem. Carnegie Mus., vol. 4, p. 168, 1909 (copied).

Bagrus crinalis Richardson, Ichth. China Japan, p. 282, 1846 (type locality: Canton).

Pimelodus guttatus Richardson, Ichth. China Japan, p. 286, 1846 (type locality: Canton).

Pimelodus mong Richardson, Ichth. China Japan, p. 286, 1846 (type locality: Canton).

Arius schlegeli Bleeker, Nederland. Tijdschr. Dierk., vol. 1, p. 146, 1863 (type locality: Amoy, China); vol. 2, p. 56, 1865 (reference).

Arius boakeii Turner, Journ. Anat. Phys., vol. 1, p. 78, 1867 (type locality: Ceylon).

Depth 4; head 3⅗, width 1⅓. Snout 2½ in head; eye 6¼, 2⅖ in snout, 3 in interorbital; mouth broadly crescentic; maxillary barbel reaches pectoral, outer mental ¾, inner ⅔ of outer; teeth villiform, broad bands across jaws, upper of 8 to 10 irregular series and lower 6; each palatine with large and nearly equilateral triangular patch; interorbital 2⅕, moderately elevated but broadly level medianly; narrow occipital fontanel as groove from opposite middle of eye to base of occipital plate; occipital bridge continuous to dorsal. Gill rakers 7+11, lanceolate, short, ¾ gill filaments or 1¼ in eye.

Cranium and occipital plate rugose striate, rather smooth to touch.

D. I, 6, first ray 1⅖ in head; adipose fin 2⅘; A. v, 14, i, second branched ray 2⅛; caudal 1⅓, upper lobe longer; least depth of caudal peduncle 4; pectoral 1⅖; ventral 1½.

Back neutral dusky or slate black, more gray on sides and entire under surface whitish. Iris grayish. Maxillary barbel and terminal end of outer mental barbel blackish, otherwise mentals white. Lips white. Spinous dorsal slate black terminally, whitish basally. Adipose fin dusky gray. Caudal grayish, dusky terminally. Pectoral dusky above, whitish beneath. Anal and ventral whitish.

India, Burma, China, Formosa.

U.S.N.M. No. 44794. Rangoon, Burma. M. Fea. Length, 148 mm. As *Arius falcarius*.

1 example. A.N.S.P. Hongkong. Henry W. Fowler. 1929. Length, 358 mm.

TACHYSURUS CAELATUS (Valenciennes)

Arius caelatus Valenciennes, Hist. Nat. Poiss., vol. 15, p. 66, 1840 (type locality: Bombay).—Bleeker, Verh. Batav. Genootsch. (Nal. Ichth. Bengal), vol. 25, p. 56, 1853 (reference); Atlas Ichth. Ind. Néerland., vol. 2, p. 35, pl. (5) 53, 1862 (Java, Madura, Sumatra, Borneo).—Günther, Cat. Fishes British Mus., vol. 5, p. 158, fig. (teeth), 1864 (Siam).—Day, Fishes of India, pt. 3, p. 459, pl. 105, fig. 5, 1877 (Moulmein).—Vinciguerra, Ann. Mus. Civ. Stor. Nat., Genova, vol. 16, p. 173, 1880 (Borneo).—Károli, Termesz. Füzetek, Budapest, vol. 5, p. 178, 1881 (Siam).—Day, Fauna British India, Fishes, vol. 1, p. 174, 1889.—Elera, Cat. Fauna Filip., vol. 1, p. 571, 1895 (Samar, Jolo).—Bartlett, Sarawak Gazette, vol. 26, No. 368, p. 181, 1896 (Moratabas).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 310, fig. 134 (upper teeth), 1913 (Djambi and Bagan Api Api, Sumatra; Banjermassin and Balikpapan, Borneo).—Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 607, 1926 (Sarawak).—Hardenberg, Treubia, vol. 13, livr. 1, p. 116, 1931 (Bagan Si Api Api).

Arius coelatus Bleeker, Versl. Meded. Akad. Wet. Amsterdam, vol. 16, p. 353, 1864 (Bangkok); Nederland. Tijdschr. Dierk., vol. 2, pp. 34, 175, 1865 (Siam).—Day, Fishes of Malabar, p. 178, 1865.

Tachysurus caelatus Fowler, Journ. Bombay Nat. Hist. Soc., vol. 32, No. 2, p. 256, 1927 (Bombay); Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 100, fig. 21, 1935 (Paknam; Bangkok); vol. 89, p. 144, 1937 (Paknam).—Suvatti, Index Fish. Siam, p. 62, 1937 (Maenam Cau Phaya; Maenam Bangpakong; Lang Suam; Maenam Maeklong; Sriracha; Pattani; Songkhla; Maenam Canthaburi).—Fowler, Proc. Acad. Sci. Philadelphia, vol. 89, p. 144, 1937 (Paknam); List Fish. Malaya, p. 49 (249), 1938 (reference).

Arius aequibarbis Valenciennes, Hist. Nat. Poiss., vol. 15, p. 68, 1840 (type locality: Rangoon; Bengal).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 56, 1853 (reference).

Arius granosus Valenciennes, Hist. Nat. Poiss., vol. 15, p. 69, 1840 (type locality: Pondicherry).—Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 56, 1853 (reference).

Arius coelatoides Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 159, 1846 (type locality: Batavia).

Arius microgastropterygius Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 160, 1846 (type locality: Batavia).

Arius clypeaster Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 161, 1846 (type locality: Batavia).

Arius clypeastroides Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 161, 1846 (type locality: Batavia).

Arius chondropterygius Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 162, 1846 (type locality: Batavia).

Arius melanopterygius Bleeker, Verh. Batav. Genootsch. (Madura), vol. 22, p. 10, 1849 (type locality: Madura Straits near Kammal and Surabaya).

Depth 4⅗ to 4⅔; head 3⅔, width 1¼ to 1⅖. Snout 2¾ to 3 in head, eye 4⅘ to 6⅓, 1⅘ to 2⅗ in snout, 2 to 3½ in interorbital; mouth width 2⅙ to 2⅘ in head; maxillary barbel reaches ⅖ to ¾ in pectoral fin, outer mental to pectoral origin or ⅗ in fin and inner mental little shorter; teeth in villiform bands in jaws of about 5 or 6 irregular rows and ovate areas of similar teeth on each palatine; front nostril larger, close to snout end in profile and hind one about midway in snout, higher, without barbels; interorbital elevated convexly, 2 to 2⅔ in head; sides and upper surface of head as occipital bones, buckler and humeral process rugose striate; broad occipital fontanel narrows behind and extends to base of keeled occipital buckler, base of which 1¼ its length and bony bridge complete to dorsal. Gill rakers 6+8, lanceolate, slender, 1⅛ in gill filaments or 2 in eye.

Skin smooth. Few venules on side of head and front of lateral line. Lateral line complete anteriorly, in young many short waved venules.

D. I, 7, compressed spine with antrorse serrae along front and hind edges, with age most of lower serrae as granules, first ray 1¼ in head to 3⅖ in combined head and body with age; A. vii, 13 or 14, first branched ray 1¾ to 1⅘ in head; adipose fin large, 2 in head; caudal 1, forked; least depth of caudal peduncle 3⅘ to 4; pectoral 1 to 1¾, spine with antrorse serrae along both edges, 12 to 17 on inner; ventral 1⅗ to 1⅔.

Back dusky brown, lower surfaces white or soiled brownish. Young with back drab gray clouded with brownish, also along lower side of trunk and tail obscure brownish dustings. Fins all pale, blackish terminally with age. Barbels dusky.

India, Burma, Siam, East Indies.

2 examples. A.N.S.P. Bombay, India, 1925. Prof. F. Hallberg. Length, 90–163 mm.

TACHYSURUS VENOSUS (Valenciennes)

Arius venosus Valenciennes, Hist. Nat. Poiss., vol. 15, p. 69, 1840 (type locality: Manila).—Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 33, pl. (6) 54, fig. 1, 1862 (Java, Madura, Bintang, Banka, Singapore).—Günther, Cat. Fishes British Mus., vol. 5, p. 159, 1864 (East Indies).—Day, Fishes of India, pt. 3, p. 460, pl. 106, fig. 2, 1877 (Nicobars); Fauna British India, Fishes, vol. 1, p. 176, 1889.—Düncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 174, 1904 (Kuala Salangor).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 314, fig. 137 (dentition), 1913 (Balikpapan, Borneo).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 45. 1937 (reference).

Tachysurus venosus Seale, Philippine Journ. Sci., vol. 5, p. 266, 1910 (Sandakan).—Fowler, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 104, 1928 (Bombay); Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 93, 1934 (Bangkok).—Suvatti, Index Fish. Siam, p. 64, 1937 (Maenam Canthaburi).—Fowler, List Fish. Malaya, p. 51, 1938 (reference).

Bagrus sumatranus Bennett, Life of Raffles, p. 691, 1830 (type locality: Sumatra).

Arius sumatranus Günther, Cat. Fishes British Mus., vol. 5, p. 162, 1864 (type).—Day, Fishes of India, pt. 3, p. 460, pl. 107, fig. 6, 1877 (type; Andamans); Fauna British India, Fishes, vol. 1, p. 176, 1889.—Bartlett, Sarawak Gazette, vol. 26, No. 368, p. 182, 1896 (Buntal).

Arius micronotacanthus Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 162, 1846 (type locality: Batavia).

Arius manjong Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 164, 1846 (type locality: Batavia).

Arius macruropterygius Bleeker, Nat. Gen. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 164, 1846 (type locality: Batavia).

Arius micruropterygius Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. p. 164, 1846 (type locality: Batavia).

Arius laeviceps Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 165, 1846 (type locality: Batavia).

? Arius malabaricus DAY, Fishes of India, pt. 3, p. 464, pl. 107, fig. 4 (head), 1877 (type locality: Canara); Fauna Brit. India, Fishes, vol. 1, p. 183, 1889.—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 30, No. 2, p. 314, 1925 (Calicut).

Depth $3\frac{4}{5}$; head $3\frac{1}{5}$, width $1\frac{1}{3}$. Snout $2\frac{1}{2}$ in head; eye 8, $3\frac{1}{5}$ in snout, $4\frac{1}{5}$ in interorbital; mouth width $2\frac{2}{5}$ in head, lower jaw inferior; maxillary barbel reaches $\frac{1}{4}$ in depressed pectoral, outer mental reaches to pectoral origin, inner little shorter; teeth in jaws villiform, in moderately wide bands and triangular palatine area on each side much deeper than wide; interorbital $1\frac{3}{4}$ in head; frontal fontanel rather narrow, with very narrow groove to predorsal plate. Gill rakers 5+9, lanceolate, $1\frac{3}{4}$ in gill filaments, which slightly less than eye.

Parietal bones, predorsal and humeral plates rugosely striate or granular, skin otherwise smooth.

D. I, 7, front edge of spine with row of low granular like serrae and 14 very small antrorse ones along median hind edge, first ray $1\frac{1}{3}$ in head; adipose fin $2\frac{7}{8}$; A. VII, 14, I, first branched ray $2\frac{2}{5}$; caudal $1\frac{1}{3}$, well forked; least depth of caudal peduncle $3\frac{7}{8}$; pectoral $1\frac{3}{5}$, spine with fine serrae along front edge and about 14 antrorse along hind edge; ventral $1\frac{4}{5}$.

Back and upper surface drab brown, soiled whitish below. Iris grayish. Barbels gray. Paired fins and anal whitish, terminally with grayish.

India, Andamans, Nicobars, Malay Peninsula, Singapore, East Indies, Philippines.

1 example. A.N.S.P. Bombay. Prof. F. Hallberg. Length, 313 mm.

Subgenus HEXANEMATICHTHYS Bleeker

TACHYSURUS SAGOR (Buchanan-Hamilton)

Pimelodus sagor BUCHANAN-HAMILTON, Fishes of Ganges, pp. 169, 376, 1822 (type locality: Ganges River).

Bagrus sagor VALENCIENNES, Hist. Nat. Poiss., vol. 14, p. 445, 1839 (copied).

Arius sagor BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 56, 1853 (reference).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 5, p. 141, fig. (teeth and occiput), 1864 (Bengal Bay and Pinang).—KNER, Reise *Novara*, Fische, p. 310, 1865 (Java).—DAY, Fishes of India, pt. 3, p. 461, pl. 105, fig. 1, 1877.—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, vol. 16, p. 172, 1880 (Borneo).—DAY, Fauna British India, Fishes, vol. 1, p. 178, 1889.—ELERA, Cat. Fauna Filip., vol. 1, p. 570, 1895 (Balabac, Samar).—BARTLETT, Sarawak Gazette, vol. 26, No. 368, p. 181, 1896 (Moratabas and Buntal).—DÜNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 173, 1904 (Klang).—SEALE, Philippine Journ. Sci., vol. 5, p. 266, 1910 (Sandakan).—WEBER and BEAUFORT, Fishes Indo-Australian Archip., vol. 2, p. 289, fig. 115 (upper teeth), 1913 (Batavia, Antjol, Surabaya, Bagan Api Api, Deli, Singapore, Balikpapan, Kota Baru).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 606, 1926 (Sarawak).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 116, 1931 (Bagan Si Api Api).

Hexanematichthys sagor Ogilby, Proc. Linn. Soc. New South Wales, vol. 23, p. 35, 1898 (Burma).

Tachysurus sagor Suvatti, Index Fish. Siam, p. 63, 1937 (Canthaburi; Bandon; Songkhla; Pakphun; Pattani; Maenam Wen).—Fowler, List Fish. Malaya, p. 50, 1938 (reference).

Bagrus sondaicus Valenciennes, Hist. Nat. Poiss., vol. 14, p. 444, 1839 (type locality: Straits of Sunda).—Cantor, Journ. Asiatic Soc. Bengal, vol. 18, p. 1237, 1849 (Sea of Pinang, Malayan Peninsula).

Hexanematichthys sundaicus Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 26, pl. (14) 62, 1862 (Java, Madura, Sumatra, Banka, Borneo).

Galeichthys sundaicus Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 462 (Baram, Borneo).

Bagrus javensis Valenciennes, Hist. Nat. Poiss., vol. 14, p. 445, 1839 (type locality: Java).

Bagrus doroides Valenciennes, Hist. Nat. Poiss., vol. 14, p. 418, 1839 (type locality: Pondicherry).—Günther, Cat. Fishes British Mus., vol. 5, p. 142, 1864 (copied).

Arius doroides Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 56, 1853 (reference).

Depth 5 to 7; head 3½ to 4⅕, width 1 to 1⅕. Snout 4 in head; eye 5½ to 7, 1⅓ to 2 in snout, 3 to 3½ in interorbital; mouth width 2 in head; maxillary barbels reach ½ to ⅘ in pectoral; outer mental barbel reaches pectoral base to ½ in pectoral fin; teeth in villiform and little arched bands in jaws; on palate 2 rounded linked patches each side with outer patch little larger, very narrow free median interspace; bones of upper surface of head coarsely granulated, with more or less radiating lines, extend to dorsal and beginning of lateral line; occipital extension broad semicircular plate, short and triangular in young, wider than long, and median keel reaches broad, expanded dorsal buckler. Gill rakers 9, short, ½ to ⅔ of eye.

Lateral line distinct, simple, axial. Axillary pore present.

D. I, 7, fin height equals head, strong spine with front edge well granulated and serrae along hind edge rather weak; adipose fin 1¾ to 2 in head; A. iii, 14 or iii, 15, fin height 1½ to 1⅔; caudal 3 to 3⅗ in rest of fish, greatly forked; least depth of caudal peduncle 3; pectoral I, 10, length 3½ to 3⅗ in fish without caudal; ventral i, 6, fin 2⅛ in head.

Dark slate brown to blackish above, under surfaces whitish.

India, Malaya, East Indies.

A.N.S.P. 3 examples. Baram, British North Borneo. 1898. Dr. William H. Furness 3rd. Length, 149–305 mm.

A.N.S.P. 1 example. Kapuas River, Borneo. 1897. A. C. Harrison and H. M. Miller.

TACHYSURUS SONA (Buchanan-Hamilton)

Pimelodus sona Buchanan-Hamilton, Fishes of Ganges, pp. 172, 376, 1822 (type locality: Bengal estuaries).—Günther, Cat. Fishes British Mus., vol. 5, p. 143, 1864 (note).

Arius sona Day, Proc. Zool. Soc. London, p. 708, 1871 (note); Fishes of India, pt. 3, p. 462, pl. 105, fig. 2, 1877 (Bombay).—Bavean, Fresh Water Fishes India, p. 143, 1877 (Bengal).—Day, Fauna British India, Fishes, vol. 1, p. 179, 1889.

Tachysurus sona Fowler, Journ. Bombay Nat. Hist. Soc., vol. 32, p. 255, 1927 (Bombay); Mem. Bishop Mus., vol. 10, p. 61, 1928 (note).

Bagrus gagorides Valenciennes, Hist. Nat. Poiss., vol. 14, p. 441, 1829 (type locality: Bengal).

Arius gagorides Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 56, 1853 (reference).—Blyth, Journ. Asiatic Soc. Bengal. vol. 27, p. 285, 1858 (Calcutta).—Günther, Cat. Fishes British Mus., vol. 5, p. 140, fig. (teeth), 1864 (Calcutta).—Bavean, Fresh Water Fishes India, p. 143, 1877 (Hoogly River).—Düncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 174, 1904.—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 288, 1913 (copied).

Tachysurus gagoroides Fowler, List Fish. Malaya, p. 49, 1938 (reference).

Bagrus trachipomus Valenciennes, Hist. Nat. Poiss., vol. 14, p. 443, 1839 (type locality: None=Bengal).

Arius trachipomus Bleeker, Verh. Batav. Genootsch. (Nal. Ichth. Bengal), vol. 25, p. 58, 1853 (reference).

Netuma netuma (not Valenciennes) Day, Fishes of Malabar, p. 175, 1865.

Arius graeffei Kner and Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 54, p. 383, fig. 12, 1866 (type locality: Samoa).—Günther, Journ. Mus. Godeffroy, pt. 16, p. 373, 1909 (copied).

Depth 5; head $3\frac{1}{4}$ to $3\frac{2}{5}$, width $1\frac{1}{6}$ to $1\frac{1}{5}$. Snout $2\frac{7}{8}$ to 3 in head; eye 6 to $6\frac{1}{4}$, 2 to $2\frac{1}{4}$ in snout, $2\frac{2}{3}$ in interorbital; mouth width $1\frac{9}{10}$ to 2 in head; maxillary barbel reaches $\frac{3}{4}$ to $\frac{7}{8}$ in pectoral, outer mental $\frac{2}{5}$, inner mental $\frac{7}{8}$ or to pectoral origin; bands of villiform teeth in jaws of about 5 or 6 transverse irregular series; on palate 2 small closely approximated patches of villiform teeth and 2 large rounded posterior areas more separated; interorbital little elevated convexly, width $2\frac{1}{5}$ to $2\frac{1}{2}$ in head; head above and occiput striate; occipital fontanel not quite reaching base of keeled occipital buckler, basal width of which $1\frac{1}{5}$ its length, though bony bridge complete to dorsal. Gill rakers 5+10, lanceolate, $1\frac{1}{4}$ in gill filaments, which $1\frac{1}{4}$ in eye.

Skin smooth. Lateral line complete, midway along side.

D. I, 7, compressed spine with antrorse serrae along front and hind edges, first ray $1\frac{1}{4}$ to $1\frac{1}{3}$ in head; A. iv, 11, first branched ray $1\frac{9}{10}$ to 2; caudal forked, $1\frac{1}{10}$ to $1\frac{1}{6}$; least depth of caudal peduncle $3\frac{7}{8}$ to $4\frac{1}{4}$; pectoral $1\frac{1}{5}$, compressed spine with outer and inner edges with antrorse serrae, 10 along inner edge; ventral $1\frac{7}{8}$ to $2\frac{1}{8}$.

Leaden gray, little paler below. Iris gray. All fins dusky to blackish terminally.

India, East Indies, Polynesia.

U.S.N.M. No. 72536. Batavia. April 2, 1909. Bryant and Palmer. Length, 61–205 mm. 2 examples.

U.S.N.M. No. 72536. Palaboean Ratoe, Java. October 1909. O. Bryant. Length, 143 mm.

2 examples. A.N.S.P. Bombay, India. Prof. F. Hallberg. 1925. Length, 108–120 mm.

Subgenus Netuma Bleeker

TACHYSURUS THALASSINUS (Rüppell)

Bagrus thalassinus Rüppell, Neue Wirbelth., Fische, p. 75, pl. 20, fig. 2, 1835 (type locality: Massaua, Red Sea).

Netuma thalassina Bleeker, Atlas Ichth. Ind. Néerland., vol. 2, p. 28, 1862 (Java, Sumatra, Nias, Bintang, Celebes).—Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 500, 1904 (Padang); Proc. Acad. Nat. Sci. Philadelphia, 1915, p. 204 (Padang example).—Ogilby, Commercial Fish. Fisher. Queensland, p. 47, 1915.—Fowler, Copeia, No. 58, p. 62, 1918 (Philippines).—McCulloch, Fishes New South Wales, ed. 2, p. 22, pl. 7, fig. 74a, 1927.—Fowler, Mem. Bishop Mus., vol. 10, p. 62 (compiled); vol. 11, p. 318, 1928 (reference).

Netuma thalassinus Evermann and Seale, Bull. Bur. Fisher., vol. 26 (1906), p. 56, 1907 (San Fabian; Bulan; Philippines).—Jordan and Richardson, Bull. Bur. Fisher., vol. 27 (1907), p. 242, 1908 (Philippines).—Weber and Beaufort, Fishes Indo Australian Archip., vol. 2, p. 286, fig. 114 (upper teeth), 1913 (Batavia, Singapore, Sumbawa, Timor, Rotti, New Guinea).

Arius thalassinus Günther, Cat. Fishes British Mus., vol. 5, p. 139, fig. (teeth and occiput), 1864 (East Indies, Singapore, Red Sea, Java).—Kner, Reise *Novara*, Fische, p. 310, 1865 (no locality).—Günther, Fishes of Zanzibar, p. 114, 1866 (Aden; Zanzibar).—Klunzinger, Verh. zool.-bot. Ges. Wien, vol. 21, p. 589, 1871 (Red Sea).—Macleay, Proc. Linn. Soc. New South Wales, vol. 1, p. 348, 1876 (off Katow, New Guinea).—Day, Fishes of India, pt. 3, p. 463, pl. 104, fig. 4, pl. 106, fig. 1, 1877 (Andamans).—Alleyne and Macleay, Proc. Linn. Soc. New South Wales, vol. 1, p. 348, 1877 (Torres Straits, New Guinea, Katow).—Macleay, Proc. Linn. Soc. New South Wales, vol. 2, p. 363, 1878 (Port Darwin).—Schmeltz, Cat. Mus. Godeffroy, No. 7, p. 56, 1879 (Tonga Islands).—Klunzinger, Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, p. 409, 1880 (Queensland).—Macleay, Proc. Linn. Soc. New South Wales, vol. 6, p. 212, 1881 (Torres Strait and Port Darwin).—Meyer, Anal. Soc. Españ. Hist. Nat. Madrid, vol. 14, p. 41, 1885 (Macassar, South Celebes; Kordo, Mysore).—Boulenger, Proc. Zool. Soc. London, 1887, p. 665 (Muscat).—Day, Fauna British India, Fishes, vol. 1, p. 181, 1889.—Kent, Great Barrier Reef, p. 298, 1893 (Moreton Bay).—Düncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 174, 1904 (reference).—Steindachner, Denkschr. Akad. Wiss., Wien, math.-nat. Kl., vol. 71, pt. 1, p. 156, 1907 (Aden).—Weber, Nova Guinea, vol. 9, p. 536, 1913 (Ostbai).—Zugmayer, Abh. Bayer Akad. Wiss., math.-phys. Kl., vol. 26, p. 9, 1913 (Mekran, Oman).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 286, fig. 114 (dentition), 1913 (Batavia, Singapore, Sumba, Timor, Rotti, New Guinea).—Herre, Philippine Journ. Sci., vol. 31, p. 407, pl. 1, fig. 7 (dentition), 1926 (Manila Bay, Bulan, Laguna de Bay, Culian); Fishes Herre Philippine Exped. 1931, p. 22, 1934 (Laguna de Bay; Manila).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 45, 1937 (reference).

Tachysurus thalassinus Suvatti, Index Fish, Siam, p. 64, 1937 (Gulf of Siam; Phuket).—Fowler, List Fish. Malaya, p. 50 (249), 1938 (reference).

Bagrus bilineatus VALENCIENNES, Hist. Nat. Poiss., vol. 14, p. 434, 1839 (type locality: Pondicherry; Rangoon).

Bagrus netuma VALENCIENNES, Hist. Nat. Poiss., vol. 14, p. 438, pl. 417, 1839 (type locality: Pondicherry).

Netuma netuma DAY, Fishes of Malabar, p. 175, fig. (teeth and casque), 1865.

Arius nasutus VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 60, 1840 (type locality: Malabar; Red Sea).

Catastoma nasutum (Kuhl and Van Hasselt) VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 60, 1840 (Java) (name in text).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 2, p. 28, 1862 (name in synonymy).

Netuma nasuta BLEEKER, Atlas Ichth. Ind. Néerland., vol. 2, pl. (13), 61, 1862.—JORDAN and SEALE, Bull. Bur. Fisher., vol. 26 (1906), p. 8, 1907 (Cavite).

Bagrus rhodonotus BLEEKER, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 157, 1846 (type locality: Batavia).

Bagrus carchariorhynchos BLEEKER, Nat. Geneesk. Arch Nederl.-Indië, vol. 3, pt. 2, p. 291, 1846 (type locality: Batavia).

Sarcogenys rostratus (Kuhl and Van Hasselt) BLEEKER, Atlas Ichth. Ind. Néerland., vol. 2, p. 28, 1862 (name in synonymy).

Arius andamanensis DAY, Proc. Zool. Soc. London, 1870, p. 699 (type locality: Andaman Islands).

Ariodes aencus SAUVAGE, Bull. Soc. Philomath., Paris, ser. 7, vol. 7, p. 156, 1883 (type locality: "Ile Raffles: Voyage de la Zélee").

Netuma osakae JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 157, pl. 9, fig. 1, 1925 (type locality: Japan).

Depth 4¾ to 5; head 3 to 3⅕, width 1⅖ to 1⅔ its length. Snout 2⅖ to 2¾ in head; eye 4¼ to 7¾, 1½ to 2 in snout, 2 to 3 in interorbital; mouth width 2½ to 2⅗ in head, widely crescentic; lips with thick folds at mouth corners; maxillary barbel reaches beyond eye or to gill opening, outer mental behind hind eye edge, inner mental to eye or slightly beyond; teeth fine in rather broad bands in jaws; teeth on palate in 2 large, triangular patches, base of each triangle with 2 more or less rounded, small, close-set patches; preorbital groove extends little beyond front eye edge; median fontanel reaches base of occipital process, latter forming complete bridge to dorsal. Gill rakers 8 or 9, short, conic, thick.

Skin smooth. Sides of head above, occipital bridge, dorsal shield and humeral shield striate or granulated.

D. I, 7, spine 1⅓ to 1⅔ in head, granulated in front and hind edges serrate; A. VI, 11 or 12, first branched ray 3⅗ to 3⅔; lower caudal lobe 1 to 1⅓; least depth of caudal peduncle 3½; pectoral 1⅓ to 1¾; ventral 2⅓ to 2⅔.

Largely silvery, grayish above. Adipose fin with large blackish brown blotch.

Red Sea, Arabia, Zanzibar, India, Andamans, Burma, Singapore, East Indies, Philippines, China, Japan, North Australia, Queensland, New South Wales, Polynesia.

11943. Alimango Bay, Burias Island. March 5, 1909. Length, 52 mm.
5515. Malabon market. August 8, 1908. Length, 59 mm.

6264, 6265, 8191, 8192. Manila Market. June 12, 1908. Length, 128–160 mm.
12104. Manila market. June 11, 1908. Length, 195 mm.
9263. Manila market. July 10, 1908. Length, 214 mm.
17607. Manila market. July 29, 1908. Length, 197 mm.
20245 to 20247. San Roque market, Cavite. June 13, 1908. Length, 158–230 mm.
A 1016. Philippines. Length, 188 mm.
5008 to 5010. Sandakan Bay, Borneo. March 2, 1908. Length, 187–230 mm.
2 examples. A.N.S.P. Padang, Sumatra. A. C. Harrison and H. L. Hiller. Length, 616 mm.
2 examples. A.N.S.P. San Fernando, Luzon. Rev. Joseph Clemens. Purchased.
1 example. A.N.S.P. Santa Maria, Luzon. Rev. Joseph Clemens. Purchased.
1 example. A.N.S.P. Orani, Luzon. Rev. Joseph Clemens. Purchased.
5 examples. A.N.S.P. Orion, Luzon. Rev. Joseph Clemens. Purchased.
8 examples. A.N.S.P. Philippines. Commercial Museum Philadelphia.

Subgenus PSEUDARIUS Bleeker

TACHYSURUS MANILLENSIS (Valenciennes)

Arius manillensis VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 93, 1840 (type locality: Manila).—HERRE, Philippine Journ. Sci., vol. 31, p. 403, pl. 1, fig. 5 (dentition), 1926 (Laguna de Bay, Pasig River, Santa Cruz, Orani, Cavite); Fishes Herre Philippine Exped. 1931, p. 22, 1937 (Manila; Mayondon).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 45, 1937 (reference).

Rita manillensis GÜNTHER, Cat. Fishes British Mus., vol. 5, p. 94, 1864 (copied).

Rita manillense ELERA, Cat. Fauna Filip., vol. 1, p. 570, 1895 (Luzon, Manila, Navotas).

Pseudarius philippinus SAUVAGE, Bull. Soc. Philom., Paris, ser. 7, vol. 4, p. 226, 1880 (type locality: Lake Laglaize, Luzon).

Arius falcarius (not Richardson) MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 41, 1885 (Santa Cruz, from Laguna de Bay).

Depth 4⅗; head 3$\frac{1}{10}$ to 3⅓, width 1⅖. Snout strongly projects, broad, blunt, slightly rounded; eye 6⅖ to 6¾, 2½ to 2⅘ in snout, 3 in interorbital, ovate pupil vertical; maxillary barbel reaches hind edge of head or to middle of pectoral in young, mandibular ⅔ maxillary, mental less than half as long; upper teeth sharp, villiform, widest at ends, width 5½ its length, exposed when mouth closes; lower teeth villiform, in much longer band; beginning at front edge of palate and covering most its front surface, thus not far apart, 2 large, parallel, somewhat ovate patches of blunt, rounded, coarsely granular, thickly crowded teeth, broadest near front end, length about 1½ in eye; plates on top of head granulose, with very long median fontanel from opposite hind nostril nearly to occipital process; last subtriangular, with widely expanded base about long as process; basal bone of dorsal spine narrow, short, surface granulate; humeral plate nearly triangular, smooth or lower edge somewhat granular. Gill rakers 6+12, ½ of eye.

Dorsal equals or little less than depth, 1½ in head, stout spine granulate serrate before and behind; adipose fin base twice in anal base; A. 17 or 18; caudal deeply lobate, upper lobe longer or lobes nearly equal; pectoral $1\frac{3}{5}$ in head, spine trifle longer than dorsal spine, flattened, outer edge feebly serrate, inner edge strongly serrate, rays 10; ventral slightly longer than pectoral.

Blackish to leaden above, passing into whitish below, with brilliant metallic silver and golden bronze luster, underside of head and belly cream. Fins all blackish on both sides, except dorsal and adipose fin with narrow milk white border. Length, 244 mm. (Herre.)

Philippines. The type, originally from Manila, was 355 mm. long.

Subgenus ARIODES Müller and Troschel

TACHYSURUS MAGATENSIS (Herre)

Arius magatensis HERRE, Philippine Journ. Sci., vol. 31, p. 396, pl. 1, fig. 1 (dentition), 1926 (type locality: Magat River at Bagabag, Nueva Vizcaya Province; upper Cagayan Valley in Cagayan River); Fishes Herre Philippine Exped. 1931, p. 22, 1934 (Bayombong).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 44, 1937 (reference).

Depth $5\frac{1}{10}$ to $5\frac{1}{3}$; head $3\frac{1}{3}$ to $3\frac{3}{5}$, width $1\frac{2}{5}$ to $1\frac{1}{2}$. Snout $2\frac{2}{3}$ to 3 in head, projects, somewhat angulate and pointed centrally; eye $5\frac{3}{5}$ to $6\frac{9}{10}$, $1\frac{4}{5}$ to $2\frac{2}{3}$ in snout, $2\frac{1}{2}$ to 3 in interorbital; maxillary barbel to hind edge of head or pectoral base, mandibular $\frac{7}{10}$ long as maxillary, mental about $\frac{2}{5}$; upper lip projects, partially exposes upper band of teeth, inner margin of lips finely rugose; upper jaw teeth villiform, in narrow arched band, width 4 to $4\frac{2}{5}$ its length; lunate lower band longer than upper, widest medially, tapers to point at each end; ovate-elliptical patch of 16 to 26 granular teeth each side of forward outer angle of palate, posteriorly pair of somewhat elliptical larger patches of coarse granular teeth subequal with eye; plates on top of head granulose, with very long median fontanel not reaching occipital process; last a truncate triangle, basal bone of dorsal spine lunate, narrow, granulose and short; humeral plate triangular, surface granular. Gill rakers 6+12, equal pupil or little over half of gill filaments.

Dorsal $1\frac{1}{5}$ to $1\frac{1}{4}$ in head, spine $1\frac{3}{5}$ to $1\frac{4}{5}$, moderately strong, sharp pointed granulose anteriorly, smooth behind; adipose fin base $1\frac{3}{4}$ to 2 in anal base; A. 19 or 20; caudal deeply lobate, upper lobe longest; pectoral I, 11, spine subequal with dorsal spine, both edges variably slightly roughened to finely but strongly serrate, fin, $\frac{1}{4}$ to $1\frac{1}{2}$ in head; ventral $1\frac{2}{3}$ to 2.

Bluish to dark chocolate brown above, darkest on top of head, sides paler. Reddish plum to whitish or yellowish below, with silver luster all over sides. Cream color or white beneath. Fins chocolate to red brown, caudal palest. Length, 268 mm. (Herre.)

Cagayan River. Only known from fresh water. Said to reach over 450 mm. and a male found with its mouth filled with large incubating eggs, 12 to 15 in number.

TACHYSURUS CROSSOCHEILUS (Bleeker)

Arius crossocheilus Bleeker, Natuur. Geneesk. Arch. Nederl. Indië, vol. 3, pt. 2, p. 137, 1846 (type locality: Batavia).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 276, fig. 107 (upper teeth), 1913 (Bay of Boni, Celebes).—Herre, Philippine Journ. Sci., vol. 31, p. 398, pl. 1, fig. 2, 1926 (compiled).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 44, 1937 (reference).

Arius tonggol Bleeker, Nat. Geneesk. Arch. Nederl. Indië, vol. 3, pt. 2, p. 292, 1846 (type locality: Batavia).—Günther, Cat. Fish. Brit. Mus., vol. 5, p. 164, text fig. (teeth), 1864 (type).—Meyer, Anal Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 41, 1885 (Laguna de Bay).—Elera, Cat. Fauna Filip., vol. 1, p. 570, 1895 (Luzon, Laguna de Bay).

Ariodes tonggol Bleeker, Nat. Tijds. Nederland. Indië, vol. 20, pp. 238, 450, 1859–60 (Singapore); Atlas Ichth. Ind. Néerland., vol. 2, p. 39, pl. (9) 57, 1862 (Java, Sumatra, Bintang, Banka).

Tachysurus tonggol Fowler, List Fish. Malaya, p. 51, 1938 (reference).

Depth 4½ to 4⅞; head 3⅕ to 3¼, width 1⅖ to 1⅗. Snout 2⅕ to 2½ in head; eye 5⅓ to 6⅕, 2 to 3 in snout, 2⅞ to 4 in interorbital; mouth width 3 to 3⅙ in head; maxillary barbel reaches pectoral origin, ⅕ in depressed pectoral in young, outer mental reaches ¾ to pectoral origin or to latter in young, inner mental half way or ⅗ to pectoral origin in young; moderate arcuate band of villiform teeth in each jaw; on palate globular teeth in 4 separated patches, as 2 well separated small patches anteriorly and 2 large ovoid patches posteriorly close set and long axis converging behind; interorbital 1⅞ to 2, broadly convex; cranium with some rather feeble granulations and striae; fontanel long, rather narrow, not quite reaching occipital plate; occipital plate little longer than basal width, narrow hind end in contact with basal buckler. Gill rakers 4+18, lanceolate; 2⅔ in gill filaments which 1¼ in eye.

Skin smooth. Humeral plate smooth, striae feeble.

D. I, 7, first branched ray 1¼ to 1⅖ in head; adipose fin length 3 to 3⅓; A. v, 11, i, first branched ray 2⅔ to 2⅞; caudal 1⅒ to 1⅛, deeply forked, lobes pointed and upper slightly longer; least depth of caudal peduncle 3⅗ to 4⅛; pectoral 1⅓ to 1½, front and hind edges of spine antrorsely serrate; ventral 1⅘ to 2.

Brown above, with silvery white on sides and below, showing pale lilac and lavender reflections on sides. Under side of head and abdomen sometimes more or less soiled with brownish, as on upper surface. Iris pale yellowish or brassy. Barbels brownish. Fins all with more or less dusky terminally or on paired ones medially.

Singapore, East Indies, Philippines.

8850. River at Catbalogan, Samar market. April 15, 1908. Length, 141 mm.
18308 to 18310. River at Makassar, Celebes. December 29, 1906. Length, 218 to 227 mm.

TACHYSURUS ARGYROPLEURON (Valenciennes)

Arius argyropleuron (Kuhl and Van Hasselt) VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 104, 1840 (type locality: Java).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 5, p. 164, 1864 (types of *Arius acutus*).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 57, pt. 1, p. 1003, 1868 (no locality).—SEALE, Philippine Journ. Sci., vol. 5, p. 266, 1910 (Sandakan).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 278, fig. 108 (head above), fig. 109 (upper teeth), 1913 (Bagan Api Api, Balikpapan).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 116, 1931 (Bagan Si Api Api).

Ariodes argyropleuron BLEEKER, Atlas Ichth. Ind. Néerland., vol. 2, p. 40, pl. (11)59, 1862 (Java, Sumatra).

Tachysurus argyropleuron FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 462 (Baram River, Borneo).—SUVATTI, Index Fish. Siam, p. 61, 1937 (Lang Suan; Songkhla; Canthaburi).—FOWLER, List Fish. Malaya, p. 49(249), 1938 (reference).

Arius acutus BLEEKER, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 167, 1846 (type locality: Batavia).

Arius hamiltonis BLEEKER, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 291, 1846 (type locality: Batavia).

Depth 4¾ to 5; head 3½, width 1⅐. Snout 2¾ in head; eye 4½ to 7, 2 in snout, 2¾ in interorbital; maxillary barbels reach pectorals or not quite so far, mandibulary barbels somewhat shorter, mental barbels reach gill membrane; villiform teeth in arcuate band in jaws; granular teeth far back on palate in 2 oval groups, long axes converging hindward; 2 small patches on front of palate, reduced to few small teeth or even wanting; interorbital 1⅘ in head. Gill rakers 7 or 8, short, stout.

Head shields with roughened and granulated lines; occipital extension in young, longer than broad, lateral edges straight, twice or more than twice longer than broad in its middle, touching basal bone of dorsal, which with winglike extremities. Median fontanel begins on snout and ends before occipital extension, broadest medianly.

D. I. 7, height over 1½ in head, rather weak spine long as head without snout, at top and front border slightly denticulated and along whole of hind border; adipose fin small, base much less than that of soft dorsal or 4½ in interspace; A. 19 or 20; pectoral I, 11, long as head without snout, flattened spine somewhat shorter and stronger than that of dorsal; ventral 6, not reaching anal and much shorter than pectoral.

Brownish above, whitish below. Outer half of fins dusky. Length, 460 mm. (Weber and Beaufort.)

East Indies (Java, Sumatra, Borneo).

TACHYSURUS LEIOTETOCEPHALUS (Bleeker)

Arius leiotetocephalus Bleeker, Nat. Geneesk. Arch. Nederl.-Indië, vol. 3, pt. 2, p. 292, 1846 (type locality: Batavia).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 2, p. 282, fig. 112 (upper teeth), 1913 (north of Rio Straits).—Herre, Philippine Journ. Sci., vol. 31, p. 379, pl. 1, fig. 3 (dentition), 1926 (San Miguel Bay; Tacloban; Manila market).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 45, 1937 (reference).

Ariodes leiocephalus Bleeker, Ichth. Arch. Ind. Prodr., vol. 1, Siluri, p. 88, 1858; Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 64, 1861 (Pinang); Atlas Ichth. Ind. Néerland., vol. 2, p. 40, pl. (12) 60, fig. 2, 1862 (Java, Singapore, Celebes).

Arius liocephalus Günther, Cat. Fish. Brit. Mus., vol. 5, p. 165, 1864 (no locality).—Düncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 174, 1904 (Kuala Pahang; Muar River).

Tachysurus leiotetocephalus Suvatti, Index Fish. Siam, p. 62, 1937 (Gulf of Siam; Bang Plasoi; Sriracha).—Fowler, List Fish. Malaya, p. 49, 1938 (reference).

Bagrus (*Ariodes*) *meyenii* Müller and Troschel, Horae Ichth., pt. 3, p. 9, 1849 (type locality: "Unbekannt").

Depth 4⅖; head 3, width 1½. Broad snout expanded laterally and upward between eyes and nostrils, blunt tip broadly rounded, projects; eye 7⅕ in head, 3⅘ in interorbital; maxillary barbel reaches nearly or quite to hind opercle edge, mandibular barbel ⅔ maxillary, mental little over ½ maxillary; inner edge of upper lip crenate-lobulate, lower lip covered with transverse corrugations; upper curved villiform band of jaw teeth very sharp; lower band narrower, sharp; 2 small, widely separated, oval patches on palate and posteriorly 2 additional elongate patches narrowing posteriorly; occipital process large, ovate, elevated centrally and in front, surface rough with convoluted ridges, width 1⅓ its length; top of head smooth, with long median fontanel from snout nearly to occipital process; humeral plate smooth, triangular. Gill rakers 8 or 9, short, stiff.

Dorsal nearly equals depth, stout spine 1½ in head, stout spine with coarse granulations anteriorly, hind side nearly or quite smooth; small adipose fin with base 3 in anal base; A. 15 to 17; caudal deeply lobate; pectoral 1½ in head, flattened spine equals dorsal spine, serrated before and behind, rays 12 or 13.

Reddish brown, with metallic silvery sheen, underside cream to bluish white. Belly thickly sprinkled with minute violet brown ocellated specks. Fins dusky yellowish. Length, 370 mm. (Herre.)

Malacca, Pinang, Singapore, East Indies, Philippines.

TACHYSURUS GONIASPIS (Bleeker)

Arius goniaspis Bleeker, Act. Soc. Sci. Ind.-Néerl., vol. 3, No. 9, p. 4, 1858 (type locality: Trussan, Sumatra); p. (5) 44, 1857–58 (Priaman).—Günther, Cat. Fish. Brit. Mus., vol. 5, p. 166, 1864 (type).—Bartlett, Sarawak

Gazette, vol. 26, No. 368, p. 182, 1896 (Moratabas).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 283, 1913 (compiled).—HERRE, Philippine Journ. Sci., vol. 31, p. 401, pl. 1, fig. 4 (dentition), 1926 (Laguna de Bay, Manila market).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 44, 1937 (reference).

Ariodes goniaspis BLEEKER, Atlas Ichth. Ind. Néerland., vol. 2, p. 42, pl. (12) 60, fig. 1, 1862 (Sumatra).

Depth 5⅕; head 3⅓, width 1½. Snout projects, broadly rounded, depressed, convex, 2⅗ in head; eye 2⅗ in snout, 2⅗ in interorbital; maxillary barbel reaches hind end of head, mandibular almost to pectoral base or 1½ in maxillary, mental 2⅖; mouth moderate, teeth exposed when closed; upper sharp villiform teeth in curved band, width 4½ in length; lower teeth in longer band, widest medially and tapering posteriorly; conic, coarsely granular teeth in 2 groups each side, small ovate patch at outer front margin and elongate divergent patch posteriorly; head granulated above; occipital process triangulate, lateral edges straight, expanded basally, wide as long, more or less radially granulate, with central keel, slightly notched hind edge touching short, granulate, curved bone before dorsal spine base; median fontanel reaches opposite hind angular preopercle tip; humeral plate sharply triangular, surface rugose. Gill rakers 8+12, slender, 2⅕ in eye.

Dorsal 1⅓ in depth, nearly 1⅕ in head, spine 1¾, front edge rugose and barbed near apex, hind edge barbed; adipose fin base 1¾ in anal base; A. 17; caudal deeply notched, upper lobe longer; pectoral nearly 1½ in head; spine equals dorsal spine, with similar rugosities and toothed barbs, rays 11; ventral 2 in head.

Chocolate brown on head, gradually paler posteriorly along back, whitish below lateral line. Sides of head passing into reddish brown and whitish, all with silvery luster except along median dorsal region of head and back. White beneath. Dorsal and pectorals blackish, more or less hyaline marginally. Adipose fin blackish basally or reddish brown by transmitted light, becomes clear marginally. Caudal reddish brown basally, with silver sheen, rays yellowish brown, become clear posteriorly. Ventral white beneath, somewhat dusky above along outer basal region. Length, 208 mm. (Herre.)

Sumatra, Borneo, Philippines.

Genus OSTEOGENEIOSUS Bleeker

Osteogeneiosus BLEEKER, Nat. Geneesk. Arch. Nederl.-Indië, vol 3, pt. 2, p. 173, 1846. (Type, *Osteogeneiosus macrocephalus* Bleeker=*Silurus militaris* Linnaeus, virtually monotypic.)

Osteogeniosus GÜNTHER, Cat. Fishes British Mus., vol. 5, p. 181, 1864. (Type, *Silurus militaris* Linnaeus.)

Osteogenius CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1241, 1849. (Type, *Silurus militaris* Linnaeus, virtually. *Osteogenius* Cantor proposed to replace *Osteogeneiosus* Bleeker.)

Body elongate. Head strongly depressed. Upper jaw protrudes. Eyes lateral, with free orbital margin. Mouth arched, lips thin. Only 1 barbel at each maxillary, very stiff and bony. Villiform teeth in bands in jaws, on palate in 2 separated patches, obtusely conic. Nostrils together, posterior with valves, placed superiorly near front edge of snout. Gill membranes united, free hind border deeply emarginate, only anteriorly connected with isthmus. Branchiostegals 5. Top of head covered with smooth skin. Short dorsal with 7 rays and pungent spine, placed between pectorals and ventrals. Adipose fin short, opposite short anal. Caudal forked, lobes rounded. Pectorals with pungent spine. Ventral rays 6.

One species, marine, entering estuaries and tidal rivers.

OSTEOGENEIOSUS MILITARIS (Linnaeus)

Silurus militaris LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 305, 1758 (type locality: Asia); ed. 12, vol. 1, p. 503, 1766.—BONNATERRE, Tableau encyclop. Ichth., p. 51, 1788 (Asia).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1356, 1789.—WALBAUM, Artedi Pisc., vol. 3, p. 566, 1792 (on Linnaeus).—BLOCH, Naturg. ausländ. Fische, vol. 8, p. 19, pl. 362, 1794 (Asia).—SHAW and NODDER, Nat. Misc., vol. 11, pl. 406, 1800 ("Surinam").—SCHNEIDER, Syst. Ichth. Bloch, p. 375, 1801 ("Surinam").

Ageniosus militaris SWAINSON, Nat. Hist. Animals, vol. 2, p. 305, 1839 (on BLOCH).

Arius militaris VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 114, pl. 430, 1840 (Bombay, Mahé, Malabar, Pondicherry, Irrawaddy, Rangoon, Malacca).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1241, 1849 (Malayan Peninsula and Islands).

Osteogeneiosus militaris BLEEKER, Atlas Ichth. Ind. Néerland., vol. 2, p. 46, 1862 (on Valenciennes).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 329, fig. 142, 1913 (Java Sea; Bagan Si Api Api, Sumatra).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 117, 1931 (Bagan Si Api Api).—SUVATTI, Index Fish. Siam, p. 64, 1937 (Maenam Bangpakong; Gulf of Siam; Thale Sap; Chumphon; Pakphun; Laem Sing; Samat Prakan; Bandon Bight).—FOWLER, List Fish. Malaya, p. 48 (248), 1938 (reference).

Osteogeniosus militaris GÜNTHER, Cat. Fishes British Mus., vol. 5, p. 181, 1864 (Ganges; type of *Osteogeneiosus cantoris*)—KNER, Reise *Novara*, Fische, p. 314, 1865 (no locality).—DAY, Fishes of Malabar, p. 181, 1865.—BAVEAN, Fresh Water Fishes India, p. 144, 1877 (Ganges River).—DAY, Fishes of India, pt. 3, p. 469, pl. 108, fig. 4, 1877 (Bombay); Fauna Brit. India, Fishes, vol. 1, p. 190, 1889.—BARTLETT, Sarawak Gazette, vol. 26, No. 368, p. 182, 1896 (Moratabas).—DÜNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 174, 1904 (Muar River).

Osteogeneiosus macrocephalus BLEEKER, Nat. Geneesk. Arch. Neder.-Indië, vol. 3, pt. 2, p. 173, 1846 (type locality: Batavia); Atlas Ichth. Ind. Néerland., vol. 2, p. 47, pl. (16) 64, 1862 (Java, Madura).—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 32, 255, 1927 (Bombay).

Osteogeniosus macrocephalus GÜNTHER, Cat. Fish. Brit. Mus., vol. 5, p. 182, 1864 (type).

Osteogeneiosus longiceps BLEEKER, Nat. Geneesk. Arch. Neder.-Indië, vol. 3, pt. 2, p. 174, 1846 (type locality: Batavia).

Osteogeneiosus ingluvies Bleeker, Nat. Geneesk. Arch. Neder.-Indië, vol. 3, pt. 2, p. 174, 1846 (type locality: Batavia).

Osteogeneiosus gracilis Bleeker, Nat. Geneesk. Arch. Neder.-Indië, vol. 3, pt. 2, p. 175, 1846 (type locality: Batavia).

Osteogeneiosus blochii Bleeker, Nat. Geneesk. Arch. Neder.-Indië, vol. 3, pt. 2, p. 175, 1846 (type locality: Batavia).

Osteogeneiosus valenciennesi Bleeker, Nat. Geneesk. Arch. Neder.-Indië, vol. 3, pt. 2, p. 175, 1846 (type locality: Batavia); Atlas Ichth. Ind. Néerland. vol. 2, p. 46, pl. (15) 63, 1862 (Java, Banka).

Osteogeniosus valenciennesii Günther, Cat. Fish. Brit. Mus., vol. 5, p. 181, 1864 (type; Pinang).—Duncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, 1903, p. 174, 1904 (compiled).

Osteogeniosus valenciennesi Vinciguerra, Ann. Mus. Civ. Stor. Nat. Genova, vol. 16, p. 181, 1880 (Borneo); ser. 3, vol. 10, p. 608, 1921–26 (Sarawak).

Osteogeneiosus cantoris Bleeker, Verh. Batav. Genootsch. (Bengal), vol. 25, pp. 120, 130, 582, 1853 (type locality: Calcutta, in River Hooghly).—Blyth, Proc. Asiatic Soc. Bengal, p. 286, 1858.

Depth 4⅘ to 5⅕; head 3¾ to 3⅞, width 1⅓. Snout 2⅞ to 3 in head; eye 6½ to 6⅔, rather low and lateral, 2⅗ to 2⅔ in snout, 3⅘ to 4⅖ in interorbital; mouth width 2⅕ in head; maxillary barbel to middle of pectoral spine; broad band of villiform teeth in each jaw, of about 7 irregular rows; on palate 2 broad semioval areas of obtuse low teeth; nostrils large, together, posterior little larger, both near snout end laterally; interorbital 1⅘ to 1⅞ in head, elevated convexly; median fontanel wide, not reaching occipital buckler, which twice wide at base as long and rugose striate, bony bridge complete to dorsal. Gill rakers 2+7, lanceolate, slender, 1¾ in gill filaments or 2 in eye.

Skin smooth. Lateral line complete and median laterally.

D. I, 7, with front and hind edges of spine antrorsely serrate, first ray 1⅓ to 1⅖ in head; adipose fin large, 2; A. iv or v, 16, i, first branched ray 1⅞ to 2; caudal 1⅕, forked; least depth of caudal peduncle 3 to 3½; pectoral 1½ to 1⅔; ventral 1⅘ to 2.

Back and head above nearly flax-flower blue, below becoming pearl blue to white. Sides of head and body with obscure gray dots. Iris pale gray. Dorsal terminally gray, whitish basally. Adipose fin whitish, with gray above. Caudal pale to whitish, with gray above and below. Anal and paired fins whitish. Barbels pale.

Seychelles, India, Burma, Pinang, Malayan Peninsula, East Indies.

2 examples. A.N.S.P. Bombay, India. Prof. F. Hallberg. 1925. Length, 158–180 mm.

Genus HEMIPIMELODUS Bleeker

Hemipimelodus Bleeker, Ichth. Arch. Ind. Prodr., vol. 1, Siluri, p. 236, 1858. (Type, *Pimelodus borneensis* Bleeker, designated by Bleeker, Ned. Tijdschr. Dierk., vol. 1, p. 92, 1863.)

Pachyula Ogilby, Proc. Linn. Soc. New South Wales, vol. 23, p. 33, 1898. (Type, *Hemipimelodus crassilabris* Ramsay and Ogilby.)

Body elongate, compressed behind. Head more or less depressed. Snout prominent, sometimes projecting and gibbous. Eyes with or without free edge. Mouth transverse, moderate to small. Maxillary, mandibular, and mental barbels slender, rather long. Each jaw with band of villiform teeth, palate edentulous. Nostrils close together, without barbel. Head shields exposed or more or less covered with skin. Occipital process keeled or winged, touches basal bone of dorsal spine. Gill membranes united, joined to isthmus along median line, leaving narrow free edge. Gill rakers moderate, short, more or less conic. Branchiostegals 5 or 6. Dorsal with pointed spine and 7 rays, origin midway between paired fins or nearer ventrals. Adipose fin moderate or short, origin above or slightly before anal. Anal rays 15 to 12. Caudal deeply forked. Pectorals with sharp spine and axillary pore present. Ventral rays 6.

A small genus of freshwater catfishes confined to the East Indies and one species in the Philippines. Apparently all live in fresh water.

HEMIPIMELODUS MANILLENSIS (Valenciennes)

Pimelodus manillensis VALENCIENNES, Hist. Nat. Poiss., vol. 15, p. 192, 1840 (type locality: Manila).

Hemipimelodus manillensis HERRE, Philippine Journ. Sci., vol. 31, p. 410, 1926 (Laguna de Bay); Fishes Herre Philippine Exped., 1931, p. 22, 1934 (Laguna de Bay).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 44, 1937 (reference).

Depth 5$\frac{1}{10}$ to 5$\frac{9}{10}$; head 3 to 3$\frac{1}{3}$, width 1$\frac{1}{2}$. Snout 2$\frac{4}{5}$ in head, projects broadly rounded; eye 6$\frac{2}{5}$ to 7$\frac{1}{5}$, 2$\frac{1}{3}$ to 2$\frac{1}{2}$ in snout, 3 in interorbital; maxillary barbel reaches or nearly reaches hind edge of head, mandibular reaches gill opening or beyond, mental scarcely $\frac{2}{5}$ of maxillary; mouth rather small, 2$\frac{4}{5}$ in head, lower jaw shorter but upper teeth not exposed; upper teeth in narrow curved band, broadest at ends, width 6 in length; lower teeth in narrower longer band, widest medially and tapering at both ends; head finely granulate above, occipital process keeled, thickly covered with small granules, much longer than broad, side sinuous, notched at apex; basal bone of dorsal spine short, curved, narrow, granulose; median fontanel very long and nearly reaches occipital process. Gill rakers 6+12, slender, $\frac{2}{3}$ or more of eye diameter.

Dorsal 1$\frac{1}{3}$ to 1$\frac{2}{5}$ in head; front edge of flattened spine granulose below and becomes serrate near tip, hind edge serrate on upper $\frac{2}{3}$ and remainder smooth, length 1$\frac{3}{4}$ to 1$\frac{9}{10}$ in head; adipose fin base 1$\frac{4}{5}$ to 2 in dorsal base or 2$\frac{1}{5}$ to 2$\frac{2}{3}$ in anal base; A. 18 to 20; caudal deeply lobed, lobes acutely pointed, upper longer or 3$\frac{1}{3}$ to 3$\frac{2}{3}$ times median rays; pectoral 1½ to 1⅔ in head, spine equals and like dorsal spine, rays 10; ventrals nearly or quite reach anal.

Blackish to chocolate-brown above to bluish brown or light brown on sides, with silvery luster, becoming yellowish white beneath. Dorsal blackish. Adipose fin with blackish or chocolate brown spot. Caudal brown, with clear posterior edge. Upper surface of pectoral blackish brown, underside pale. Ventrals and anal more or less brownish. Length, 260 mm. (Herre.)

Philippines.

Order PLECTOSPONDYLI

No teeth in jaws. Gill openings restricted. Gill membranes attached to isthmus. Pharyngeal bones below scythelike, parallel with gill arches. Two upper pharyngeals. Branchiostegals few, broad, flat, three. Brain case extended between orbits. Opercular bones all present. Parietals broad, distinct. Pterotic normal. Symplectic present. No interclavicles. Mesocoracoid present. Shoulder girdle joined to skull. Scales, when present, cycloid. Dorsal fin present. No adipose dorsal. Ventrals abdominal.

Family CYPRINIDAE

Body variously deep to elongate. Belly usually rounded, rarely compressed or serrated. Upper jaw edge formed entirely by premaxillaries. Barbels 4, 2 or absent. Gill openings moderate, membranes joined broadly to isthmus. Gills 4, slit behind fourth. Pseudobranchiae usually present. Branchiostegals few, usually 3. Lower pharyngeal bones well developed, scythe-shaped, nearly parallel with gill arches, each with 1 to 3 rows of teeth in small number, 4 to 7 in main row and fewer in others if more present. Air bladder usually large, often divided into front and hind lobe, not enclosed in bony covering and rarely absent. Stomach without appendages, formed simply as enlargement of alimentary canal. Head always naked. Body mostly scaly, seldom naked. Dorsal fin elongate or short. Ventrals abdominal.

The carps or minnows comprise the most important family in the order to which they belong, and are of interest not only in their numerous divergent species but largely in the myriads of individuals and their part in the economy of nature. They far outrank all the other families in genera, species, and individuals and also having representatives in all the countries where these other forms occur. Genera over 200 and species several thousand.

ANALYSIS OF GENERA

a^1. Dorsal with at least one of front simple rays thickened and spinelike; lateral line median along side of tail (except *Leptobarbus*).

b^1. CYPRININAE. Dorsal rays numerous; anal with spine, serrated behind.

c^1. Barbels present---------- **Cyprinus**

c^2. No barbels---------- **Carassius**

b^2. BARBINAE. Dorsal rays in moderate number or few; anal without spine, or if present entire, never serrate behind.

d^1. Lateral line median along tail.

e^1. Mouth terminal, oblique, wide, reaches beyond front eye edge; 2 maxillary barbels---------- **Hampala**

e^2. Mouth terminal or subinferior, not reaching beyond front border of eye; 2 or 4 barbels.

f^1. Lower jaw spatulate, curved upward, its tip meeting top of snout. **Mandibularca**

f^2. Lower jaw not spatulate, with more or less fleshy lip, not curved in segment of circle.

g^1. Postlabial groove not interrupted in middle behind chin and continuous around mouth corner---------- **Cephalakompsus**

g^2. Postlabial groove interrupted in middle behind chin but continuous around mouth corner.

h^1. Lower jaw truncate, reaches but halfway to end of arch of upper jaw---------- **Ospatulus**

h^2. Lower jaw not truncate, normal---------- **Puntius**

d^2. Lateral line extends along lower half of tail---------- **Leptobarbus**

a^2. Dorsal without anterior rays enlarged or spinelike; lateral line usually extends along lower side of tail.

i^1. RASBORINAE. Abdomen rounded, sometimes flattened, but not compressed to an edge; lower jaw usually with knob at symphysis, fitting in notch in front of upper jaw. **Rasbora**

i^2. ABRAMIDINAE. Abdomen at least partly compressed to an edge; mouth variable, sometimes with symphyseal knob on lower jaw---------- **Nematabramis**

Genus CYPRINUS Linnaeus

Cyprinus LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 320, 1758. (Type, *Cyprinus carpio* Linnaeus, designated by Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 16, p. 254, 1883.)

Carpio HECKEL, Rusegger's Reise, vol. 1, p. 1014, 1843. (Type, *Carpio kollarii* Heckel (hybrid), designated by Bleeker, Atlas Ichth. Ind. Néerland., vol. 3, p. 24, 1863.)

Body robust, compressed. Head moderate. Snout blunt, rounded. Mouth moderate, terminal. Barbels 4, long. Gill openings wide, reach beyond hind border of preopercle. Gill membranes broadly joined to isthmus. Pharyngeal teeth 1, 1, 3–3, 1, 1, broad, truncate, molarlike, crown furrowed, flat or concave. Scales large. Lateral line complete, extends midway along side of body. Dorsal very long, origin opposite ventral origin, front rudimentary rays spinous and last enlarged or stout and bony, its hind edges serrated. Anal short, its origin below hind half of dorsal, front rudimentary rays spinous and last strongly ossified and serrated behind.

Large fishes of the fresh waters of Asia, now widely introduced into various parts of the world as food fishes.

CYPRINUS CARPIO Linnaeus

Cyprinus carpio LINNAEUS, Syst. Nat., ed., 10, vol. 1, p. 320, 1758 (type locality: Europe).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 25, 1868 (Europe, China, Amoy, Formosa, Japan, Java).—HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924 (naturalized in rivers of Cotabato Province; Lake Nunungan, Lanap Province, Mindanao); Philippine Journ. Sci., vol. 24, p. 271 (introduced from Hong Kong to Manila, Dulauan, Pulangi River; 1916 planted in Lakes Dapao and Nunungan), p. 705, 1924 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 40, 1937 (reference).—FOWLER, List Fish. Malaya, p. 68, 1938 (reference).

? *Cyprinus fossicola* ELERA, Cat. Fauna Filip., vol. 1, p. 578, 1895 (Luzon, Cavite, Santa Cruz).

Depth 2⅖ to 2⅗; head 2⅞ to 3⅛, width 1⅖ to 1⅗. Snout 2½ to 3 in head; eye 5 to 5¼, 1⅞ to 2 in snout, 1¾ to 2¼ in interorbital; maxillary reaches ⅘ to ⅞ to eye, length 3 to 3⅓ in head; front barbel ⅔ to equal to eye, hind barbel 5 to 5⅘ in head; lower jaw included in upper; interorbital 2⅗ to 2¾, broadly convex; suborbitals cover about ⅓ to cheek to preopercle ridge. Gill rakers 4+13, lanceolate, ⅓ of gill filaments, which 4 in head. Pharyngeal teeth 1, 1, 3–3, 1, 1, robust, molarlike, with crowns flattened or somewhat furrowed.

Scales 30 to 32 in lateral line to caudal base and 3 more on latter; 6 above, 5 below, 11 to 13 predorsal, 16 around caudal peduncle. Scales with 24 basal and 67 apical radiating striae; circuli finely concentric, imperfect apically.

D. IV, 19, I to 21, I, fourth spine enlarged, osseous, hind edges with upper half at least strongly serrate, first branched ray 1⅔ to 2 in head; A. III, 5, I, third spine enlarged, osseous, hind edges strongly serrated terminally, first branched ray 1⅔ to 1¾; least depth of caudal peduncle 2 to 2⅓; pectoral 1⅖ to 1½; ventral 1½ to 1⅘; caudal 2¾ to 3⅕ in rest of body, well forked, lobes pointed.

Above olive-brown, under surfaces pale to whitish. Iris pale. Dorsal and caudal dull brownish, other fins pale to whitish.

Asia, East Indies. Introduced in the Philippines.

5944 to 5946, 7512. Hongkong market. August 13, 1908. Length, 205–224 mm.

Genus CARASSIUS Nilsson

Carassius NILSSON, Prodr. Ichth. Scandinav., p. 32, 1832. (Type, *Cyprinus carassius* Linnaeus, tautotypic.)

Cyprinopsis FITZINGER, Beitr. Landesk. Oesterreich., vol. I, p. 334, 1832. (Type, *Cyprinus auratus* Linnaeus.)

Body deeply ovoid, well compressed. Head moderate. Snout obtuse, convex. Mouth terminal, without barbels. Gill openings moderate. Gill membranes widely united with isthmus. Pharyngeal teeth uniserial, 4—4, molar and compressed. Scales large, usually uniform. Lateral line complete, extends midway along side. Dorsal fin with long base, third simple ray formed as stout spine, its hind edge serrated. Anal much shorter, with similar stout spine. Ventrals well forward.

Large fishes found in the fresh waters of Asia and Europe. Often domesticated, and the well known goldfish widely introduced into many parts of the world.

CARASSIUS AURATUS (Linnaeus)

Cyprinus auratus LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 322, 1758 (type locality rivers of China and Japan).

Carassius auratus FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines).—HERRE, Fishes Herre Philippine Exped., 1931, p. 20, 1934 (introduced in Trinidad River).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 41, 1937 (reference).

Depth 2¼ to 3¼; head 3 to 3⅓, width 1⅖ to 1⅗. Snout 3⅕ to 4 in head; eye 3⅘ to 5¾, subequal with snout, 2 to 2¼ in interorbital; maxillary reaches to hind nostril or not quite to eye, length 3⅛ to 4 in head; mouth broad, jaws about even; interorbital 2⅕ to 3 in head, broadly convex. Gill rakers 3+12, short points. Pharyngeal teeth 4—4.

Scales 26 to 28 in lateral line to caudal base and 2 or 3 more on latter; 6 above, vary 5, 5 or 6 below to anal origin, 11 to 13 predorsal. Scales large, well exposed and more or less uniform.

D. IV, 16 I, to 19 I, fourth spine osseous, enlarged, hind edge serrated, length 1½ to 2 in head; A. III, 5, I, third spine enlarged, osseous, hind edge serrated, length 1¾ to 2; least depth of caudal peduncle 1⅘ to 2; pectoral 1⅗ to 1¾, rays 15 or 16; ventral I, 8, fin 1½ to 1⅔ in head; caudal emarginate, 2¾ to 2⅘ in rest of fish.

Color largely olivaceous, paler below. Fins all more or less olivaceous, dorsal and caudal usually little darker.

Temperate eastern Asia, especially China and Japan, now widely introduced. Described from Chinese and Siamese materials.

Genus HAMPALA Van Hasselt

Hampala VAN HASSELT, Algemein Konst. Letterbode, Aout. p. 123, 1823. (Type, *Hampala macrolepidota* Van Hasselt, monotypic.)

Body elongate, compressed. Head moderate. Snout pointed. Mouth terminal, wide, oblique, extends beyond front eye edge. Jaws equal, upper little protractile. Upper lip broadened anteriorly, lower laterally. Postlabial groove or furrow runs parallel with lips, interrupted in middle of lower lip. Barbel behind mouth corner. Gill membranes united to isthmus, opposite to hind part of eye. Pharyngeal teeth spoon shaped, 1, 3, 5–5, 3, 1. Scales large, radially striated or granulated, some with reticulated lines. Lateral line complete, somewhat curved towards belly, sensory tubes undivided. No sensory folds on head and no tubercles on snout. Dorsal with 8 branched rays and low basal scaly sheath, origin opposite ventral origin, last osseous ray feeble and finely serrated. Anal with 5 branched rays.

Fresh waters of the East Indies, Malacca, Tenasserim, Siam, Indo China and the Philippines.

HAMPALA LOPEZI Herre

FIGURE 18

Hampala lopezi HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924 [type locality; Busuanga (no description)]; Philippine Journ. Sci., vol. 24, p. 275 (types), p. 705, 1924 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 40, 1937 (reference).

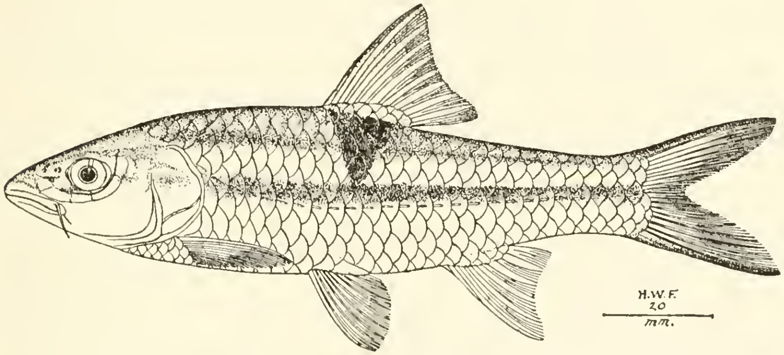

FIGURE 18.—*Hampala lopezi* Herre: Specimen from Port Caltom.

Depth $3\frac{2}{5}$ to $3\frac{2}{3}$; head 3 to $3\frac{1}{4}$, width 2 to $2\frac{1}{5}$. Snout $3\frac{1}{10}$ to $3\frac{1}{8}$ in head; eye $4\frac{1}{10}$ to $5\frac{1}{10}$, $1\frac{1}{3}$ to $1\frac{2}{3}$ in snout, $1\frac{1}{3}$ in interorbital; maxillary reaches eye, length 3 to $3\frac{1}{10}$ in head; barbel equals eye; interorbital $3\frac{2}{5}$ to $3\frac{2}{3}$, broadly convex; suborbitals narrow, barely cover $\frac{1}{5}$ of cheek. Gill rakers 2+9, lanceolate, $\frac{1}{2}$ of gill filaments, which $1\frac{2}{5}$ in eye. Pharyngeal teeth 1, 3, 5–5, 3, 1, with slight hooks and grinding surfaces.

Scales 24 in lateral line to caudal base and 2 more on latter; 5 above, 3 below, 10 predorsal, 12 around caudal peduncle. Scales with 9 to 11 basal and 14 apical radiating striae, latter more or less imperfect; circuli concentric, fine, imperfect apically.

D. IV, 8, I, fourth spine slender and little flexible, with feeble serrae along hind edges terminally, first branched ray $1\frac{1}{3}$ to $1\frac{1}{2}$ in head; A. III, 5, I, first branched ray $1\frac{3}{4}$ to $1\frac{7}{8}$; least depth of caudal peduncle $2\frac{2}{5}$ to $2\frac{2}{3}$; pectoral $1\frac{2}{3}$ to $1\frac{3}{4}$; ventral $1\frac{3}{4}$ to 2; caudal $2\frac{4}{5}$ to $3\frac{1}{3}$ in rest of body.

Back brown, sides and lower surfaces paler to whitish, with silvery white reflections, especially side of head. Dusky brown median or axial longitudinal band, indistinct on head, contrasted on body. Blackish triangle from dorsal base joins dark lateral band with its apex below dorsal. Barbel whitish. Iris whitish and gray. Fins all pale, upper and lower caudal edges dusky brown.

Busuanga Island, Philippines.

2 examples. Pangauron River, Port Caltom, Busuanga Island. December 16, 1908. Length, 120–144 mm. Agrees with Herre's account, his 3 specimens young or only 55–85 mm.

Genus MANDIBULARCA Herre

Mandibularca Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924. (Type, *Mandibularca resinus* Herre, orthotypic.)

Body oblong, rather deep, more or less compressed, strongly so posteriorly, with broad rounded ventral surface. Head rather large, little compressed. Snout short, broad, blunt, without pores or tubercles. Eye small, anterior. Mouth rather small, terminal, slightly oblique, with short protractile upper lip and thin, elongated, curved, spatula-shaped lower jaw extending upward around mouth to upper profile of snout. Upper lip wide, curtainlike, lower thin and usually absent on mandible tip. Rostral and maxillary barbels present. Gill membranes united to isthmus opposite preopercle. Gill rakers 7 to 15, short. No pseudobranchiae. Pharyngeal teeth 2, 3, 5–5, 3, 2. Scales rather large, with longitudinally radiating striae. Lateral line complete, median on caudal peduncle, tubes simple. Dorsal begins before ventrals, with scaly basal sheath, 4 front rays spinous with last jointed but not serrated and rays 8. Anal rays 5.

One species in the Lanao Plateau of Mindanao. Known by its elongate, upward-curved, and peculiarly shaped lower jaw.

MANDIBULARCA RESINUS Herre

Mandibularca resinus Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924 (type locality: Angus River, Lake Lanao, Mindanao); Philippine Journ. Sci., vol. 24, p. 273, pl. 1 (rapids of the Angus; "Lake Lanao"), p. 705, 1924 (reference).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 44, 1937 (reference).

Depth 3 to 3⅓; head 3$\frac{7}{10}$ to 4$\frac{1}{10}$. Snout 3⅕ in head from snout tip; eye 5¾, 1⅘ in snout, 1$\frac{7}{10}$ to 2 in interorbital; maxillary nearly reaches front eye edge, length 3¼ in head; barbels subequal, ¾ to 1 in eye; mouth with narrow, concave, upward curving, fleshless more or less spatulalike mandible, wide lower part fitting over closed mouth and narrower upper part curves over into space between premaxillaries so tip extends almost to or flush with upper profile of snout; interorbital wide and nearly or quite flat.

Scales 27 or 28 in lateral line (last 3 apparently on caudal base); 5 above, 3 below; 12 around caudal peduncle.

D. IV, 8, spine basally stout, without serrations, 1½ in total head; A. III, 5, first branched ray about 2; least depth of caudal peduncle 2; pectoral 1¼; ventral 1⅗; caudal about 2¾ in rest of body, well forked.

Above dark olive-green, with similar dorsal and caudal fins. Color of back merges with sides to almost golden yellow or sides brassy, outline of each scale more or less dusky, also vertical dark bar or crescent more or less evident at base of each scale. Belly white. Lower half and under side of head often nearly golden yellow. Paired fins and anal pale yellow, with more or less hyaline tips. Length, 220 mm. (Herre.)

Mindanao, Philippines, in the boiling outlet of Lake Lanao.

Genus CEPHALAKOMPSUS Herre

Cephalakompsus HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924. (Type, *Cephalakompsus pachycheilus* Herre, orthotypic.)

Body oblong, elongate, laterally compressed, with rounded abdomen. Head large, wide, much longer than body depth. Snout prominent, stout, clumsy. Eye rather small, advanced. Mouth short, large, partly inferior, somewhat horseshoe-shaped. Maxillary reaches ⅔ to eye. Both lips thick, rugose, with continuous postlabial groove parallel with lips, passing around mouth corner and across chin. Upper lip strongly protractile, lower lip and jaw included. Pair of rostral and maxillary barbels. Preorbital triangular, suborbital very narrow. Interorbital broad, concave. Gill membranes united with isthmus opposite middle of eye. Pharyngeal teeth 2, 3, 5–4, 2, 1, with pointed, irregular, hooked tips. Scales rather large, with concentric striae. Lateral line complete, descends strongly below dorsal origin then upward above anal until midway on caudal peduncle, tubes simple. Dorsal with 8 branched rays and basal scaly sheath, origin before ventral origin, fourth spine rather slender and feebly denticulated. Anal with 5 branched rays.

Known among related genera by the continuous groove behind the lower lip, extending across chin as well as around mouth, large clumsy head and snout, lack of sensory folds on head, and rather weak and feebly denticulate dorsal spine.

CEPHALAKOMPSUS PACHYCHEILUS Herre

Cephalakompsus pachycheilus HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 [type locality: Lake Lanao, Mindanao (no description)]; Philippine Journ. Sci., vol. 24, p. 276, pl. 2, fig. 2 (type), p. 705, 1924 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 44, 1937 (reference).

Depth 3⅖; head 2¾. Snout 3 in head; eye 5⅗, 1⅘ in snout, nearly 1½ in interorbital; maxillary reaches ¾ to eye, length 3⅓ in head; broad, thick fleshy upper lip strongly protractile and lower jaw included, with continuous groove behind thick lower lip; stout rostral barbels little longer than eye, still thicker maxillary barbels third longer than eye; interorbital broad, concave.

Scales 26 in lateral line (last 3 apparently on caudal base), 5 above, 3 below, 11 predorsal, 11 around caudal peduncle. Snout with small dermal nodules and raised spots.

D. IV, 8, fourth spine 2 in head, rather slender, hind edge weakly serrate; A. III, 5, first branched ray 2⅞; caudal 1⅗, deeply forked, lobes pointed; least depth of caudal peduncle 3; pectoral 2; ventral 2⅓.

Nearly uniform brownish yellow, darker dorsally, with indications of dark band from nape to dorsal fin. Snout and interorbital darkest. All fins pale, dorsal spine and rays slightly dusky. Length 134 mm. (Herre.)

Mindanao, Philippines, in Lake Lanao. Only the type known.

Genus OSPATULUS Herre

Ospatulus HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924. (Type, *Ospatulus truncatulus* Herre, orthotypic.)

Body thick, robust, with rounded abdomen and isthmus and underside of head very broad. Head moderate. Snout rather long. Eye small, anterior. Mouth rather large, subinferior, apparently not capable of closing, truncate lower jaw seemingly with front end cut off so reaching but halfway to upper jaw arch. Upper lip strongly protractile. Thick lower lip laterally extended in wide flap on each side, thus forms 2 pocketlike recesses on under side. Postlabial groove parallel to lips and continuous around mouth corners, but interrupted at chin. Rostral and maxillary barbels present. Interorbital broad, profile of back to nuchal hump straight. Gill membranes attached immediately behind hind eye end. Scales rather large, with both longitudinal radiating and concentric striae. Lateral line complete, little curved, tubes simple. Dorsal without basal scaly sheath or only feebly developed, inserted before ventral, longest spine slender and feebly denticulated.

Lake Lanao, Mindanao. Known by its peculiarly modified mouth.

ANALYSIS OF SPECIES

a^1. Dorsal spines 3; head 3⅗; 12 scales on caudal peduncle-------- **truncatulus**

a^2. Dorsal spines 4; head 2$\frac{7}{10}$; 10 scales on caudal peduncle---- **palaemophagus**

OSPATULUS TRUNCATULUS Herre

Ospatulus truncatulus HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 2569, 1924 [type locality: Lake Lanao, Mindanao (no description)];

Philippine Journ. Sci., vol. 24, p. 278, pl. 2, fig. 1, 1924 (type), p. 706 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 44, 1937 (reference).

Depth 3 1/10; head 3 2/5, short, rather blunt. Snout 2 4/5 in head; eye 5 3/4, 1 4/5 in snout; maxillary not quite reaching eye, length 3 in head; mouth terminal but apparently inferior, oblique, upper jaw strongly protractile, upper lip medium thick and much broader at mouth corners than medially; mouth appearing to be open even when closed, as truncate lower jaw very short, extends but halfway from angle of 2 jaws to front end of mouth; 2 broad fleshy flaps form lateral pockets on under side of lower lip; slender rostral barbels more than eye, stouter maxillary pair more than 1 1/2 times eye, interorbital greater than blunt snout and behind nape very decided hump in upper profile. Pharyngeal teeth 2, 2, 4 – 4, 2, 2, more or less crooked, only 1 in outer row large and some but partially developed.

Scales 26 in lateral line (last 2 apparently on caudal base); 5 above, 3 below, 11 predorsal, 12 around caudal peduncle. Lateral line slightly curved, not ascending middle of side until fifth scale from posterior end.

D. III, 8, third spine 1 2/5 in head, half again as long as minutely serrated bony part; A. III, 5, third simple ray 1 9/10; least depth of caudal peduncle 2 1/5; pectoral 1 2/5; ventral 1 1/3; caudal 3 1/8 in rest of body, well forked, lobes pointed.

Yellowish brown, dusky on dorsal half, much paler below. Top of head and region before dorsal darkest. Fins all pale, except dorsal, which slightly dusky. Length not given. (Herre.)

Lake Lanao, Mindanao. Only the type known, in Bureau of Science, Manila.

OSPATULUS PALAEMOPHAGUS Herre

Ospatulus palaemophagus HERRE, Proc. Pan. Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 [type locality: Lake Lanao; Mindanao (no description)]; Philippine Journ. Sci., vol. 24, p. 279 (type), p. 706, 1924 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 44, 1937 (reference).

Depth 3 1/3; head 2 7/10. Snout 3 in head, with prominent bump on upper surface of front end; eye 4 3/4, 1 2/3 in snout; mouth large, terminal, slightly oblique, lower jaw included, with protractile and rather thin lip; rostral barbels little shorter than eye, maxillary 1/4 longer, subequal; interorbital 1 1/3 in blunt snout, and predorsal profile with moderate nuchal bump; opercular flap extends beyond pectoral base. Pharyngeal teeth 2, 3, 4 – 4, 3, 2.

Scales 26 in lateral line; 5 above, 3 below, 10 predorsal, 10 around caudal peduncle. Lateral line greatly curved until sixth scale from hind end when midway on caudal peduncle.

D. IV, 8, origin opposite seventh scale in lateral line, moderately stout spine trifle over half of head and nearly half again long as feebly serrate hard part; A. iii, 5, low, height little over hard part of fourth dorsal spine; caudal trifle over 7/10 of head, forked, lobes wide; caudal peduncle depth 3 1/8; pectoral I, 14, reaches 4/5 to ventral; ventral I, 8, 4/5 pectoral length.

Dark yellowish brown, becomes blackish on top of head and snout and blackish brown along dorsal region. A dark opercular spot. Fins all pale except dorsal, in which spines and rays darker. Length, 105 mm. (Herre.)

Lake Lanao, Mindanao. Known only from the type, Bureau of Science, Manila.

Genus PUNTIUS Buchanan-Hamilton

Puntius Buchanan-Hamilton, Fishes of Ganges, pp. 310, 388, 1822. (Type, *Cyprinus sophore* Buchanan-Hamilton, designated by Bleeker, Atlas Ichth. Ind. Neerl., vol. 3, p. 27, 1863.)

Mystus Walbaum, Artedi Pisc., vol. 3, p. 586, 1792. (Type, *Cyprinus barbus* Linnaeus, monotypic.) (Inadmissible.)

Barbus (not Cuvier, Tabl. Element., (an. 6), p. 234, 1798, in birds) Cuvier, Règne animal, vol. 2, p. 192, 1817. (Type, *Cyprinus barbus* Linnaeus, tautotypic.)

Labeobarbus Rüppell, Mus. Senckenberg., vol. 2, p. 14, 1837. (Type, *Labeobarbus nedgia* Rüppell, monotypic.)

Cheilobarbus Andrew Smith, Illustr. zool. South Africa, Fishes, pl. 10, fig. 1, 1849. (Type, *Barbus* (*Cheilobarbus*) *capensis* Andrew Smith, designated by Jordan, Genera of Fishes, pt. 2, p. 244, 1919.)

Pseudobarbus Andrew Smith, Illustr. zool. South Africa, Fishes, pl. 11, fig. 1, 1849. (Type, *Barbus* (*Pseudobarbus*) *burchelli* Andrew Smith, designated by Jordan, Genera of Fishes, pt. 2, p. 244, 1919.)

Luciobarbus Heckel, Rusegger's Reis., Atlas, vol. 1, p. 1055, anmerk., pl. 1, 1843. (Type, *Luciobarbus esocinus* Heckel.)

Barbodes Bleeker, Nat. Tijdschr. Nederland. Indië., vol. 20, p. 431, 1859–60. (Type, *Systomus belinka* McClelland, designated by Bleeker, Nederland. Tijdschr. Dierk., vol. 1, p. 200, 1863.)

Enteromius Cope, Trans. Amer. Philos. Soc., vol. 13, p. 405, 1866 (1867). (Type, *Enteromius potamogalis* Cope, monotypic.)

Barynotus (not Germar, 1817, in Coleoptera) Günther, Cat. Fishes British Mus., vol. 7, p. 61, 1868. (Type, *Barynotus lagensis* Gunther, designated by Jordan, Genera of Fishes, pt. 3, p. 351, 1919.)

? *Spratellicypris* Herre and Myers, Lingnan Sci. Journ., vol. 10, No. 1, p. 239, 1931. (Type, *Barbodes palata* Herre, orthotypic.)

Barbellion Whitley, Australian Zool., vol. 6, p. 334, 1931. (Type, *Barynotus lagensis* Günther, virtually.)

Body more or less compressed. Head variably moderate to small. Eye large or small. Mouth small or moderately large, more or less protractile with more or less developed lips. Barbels present or absent. Suborbitals not covering cheek. Pharyngeal teeth in three series, 2 or 3, 3, 4 or 5—5 or 4, 3, 3 or 2, mostly with hooked, spoonshaped crowns, one or more of anterior series often molariform or mammilliform. Dorsal fin with or without last or fourth simple ray ossified, branched rays 6 to 11. Anal fin short, rays 7 to 10. Scaly flap usually at base of ventral.

Europe, Asia, Africa. As understood by Boulenger this is perhaps the largest genus of fishes, including a thousand or more species. They range from the small or dwarf forms common in the streams of India to the great mahseer (*Barbus mosal*), which may reach more than 2 meters in length.

The following nominal species I am unable to locate satisfactorily in the Analysis of Species:

PUNTIUS SIRANG (Herre)

Barbodes sirang HERRE, Copeia, No. 3, p. 140, 1932 (type locality: Lumbatan, Lake Lanao, Lanao Province, Mindanao); Fishes Herre Philippine Exped. 1931, p. 21, 1932 (Lumbatan).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 21, 1937 (reference).

Depth 3 to 3¼; head 3¼. Snout 3½ to 3⅗ in head; eye 3½ to 4½, very close to or projects above dorsal profile of head, hind edge midway in head length; maxillary extends beneath front eye edge; mouth terminal, moderate, lower jaw included; small and inconspicuous barbels rarely equal eye, vary little over half to ¾ an eye diameter.

Scales 24 to 26 in lateral line to caudal base and 2 or 3 more on latter; 5 above, 3 below to anal origin, 4 below to ventral origin, 8 or 9 predorsal. No elongate axillary scales.

D. IV, 8, with age free dorsal margin emarginate, origin little in advance of middle point between snout tip and caudal base and opposite ninth scale of lateral line; fourth dorsal spine of moderate size, much shorter than head, its hind edge minutely serrate; A. III, 5; deeply forked caudal little shorter than head; least depth of caudal peduncle 3⅖ times its own length; pectoral I, 14, short, 1$\frac{7}{10}$ times in head, not reaching ventral origin by 1 or 2 scales; ventral I, 8, length 2 in head, fin nearly reaches vent except in spawning females in which it may fail by more than a scale breadth.

Color in life dusky to blackish bronze above, sides silvery dusky, and gray to whitish below. Entire fish may appear black with metallic bronze or silver sheen. Dorsal, caudal, and pectoral dusky or blackish, other fins colorless. In alcohol color blackish above shading to brown or yellowish below. Dorsal, caudal, and pectorals more or less dusky, other fins pale.

Length, 40–61 mm. (Herre.)

Philippines. Said to be markedly different in appearance from any others of Lake Lanao, and when just drawn from the water appears entirely black with bronze or silvery reflections. It is valued little by the natives.

ANALYSIS OF SPECIES

a^1. Predorsal scales 8.
  b^1. Depth 2¾ to 3⅒; scales on caudal peduncle 13 or 14; axillary ventral scales ⅐ or more than eye: dorsal spines 3---------------- **hemictenus**
  b^2. Depth 2⅒ to 2⅘; dorsal spines 4.
    c^1. Depth 2⅒ to 2⅗; scales on caudal peduncle 12; axillary ventral scale 1½ to 2 in eye-- **ivis**
    c^2. Depth 2⅖ to 2⅘; scales on caudal peduncle 11, rarely 12; axillary ventral scale much less than eye------------------------------- **tumba**
a^2. Predorsal scales 8 or 9.
  d^1. Four large black spots, often with dark band, along middle of side; usually dark spot at dorsal base and often at anal base; dorsal spines 4; depth 2⅔ to 3.
    e^1. Scales 13 or 14 on caudal peduncle--------------- **quinquemaculatus**
    e^2. Scales on caudal peduncle 12.
      f^1. Depth 2⅔ to 3⅓; head 3 to 3⅞; dorsal spine serrate-- **binotatus**
      f^2. Depth 3½; head 4½; dorsal spine smooth------------- **montanoi**
  d^2. No dark spots or bands on side.
    g^1. Depth 3 to 3⅓; 11 predorsal scales; dorsal spines 2-- **clemensi**
    g^2. Depth 2⅞ to 3; 12 predorsal scales; dorsal spines 3-- **cataractae**
a^3. Predorsal scales 9.
  h^1. Scales on caudal peduncle 11.
    i^1. Scales 22 to 24 in lateral line, rarely 25 or 26; dorsal spines 4; dark silver band from shoulder to caudal. **amarus**
    i^2. Scales 24 to 29 in lateral line; dorsal spines 3; no spots or dark band on sides------------------------- **flavifuscus**
  h^2. Scales on caudal peduncle 12 or 13; scales 27 or 28 in lateral line; 4 large dark spots and broad dark band over side. **manguaoensis**
a^4. Predorsal scales 9 or 10.
  j^1. Four large dark spots and dark bar along side; dark spot at dorsal base.
    k^1. Scales 16 around caudal peduncle----------- **sibukensis**
    k^2. Scales 12 around caudal peduncle--------- **bantolensis**
  j^2. No dark spots or bars on side.
    l^1. Uniform light brown above, below silvery white. **lanaoensis**
    l^2. Golden yellow, top of head dusky, below yellowish white------------------------------------ **baoulan**
a^5. Predorsal scales 10 or 11; front barbel 2 to 2⅕ in head, hind barbel 1⅘ to 2; 15 scales around caudal peduncle; upper and lower caudal edges blackish. **collingwoodi**
a^6. Predorsal scales 11 or 12.
  m^1. Caudal peduncle deep, its depth 2⅖ to 2 3/7 in head. **disa**
  m^2. Scales 11 around caudal peduncle; depth 3⅓ to 3⅗; uniform yellowish brown, back and head above slightly dark--------------------- **katolo**
  m^3. Scales 13 around caudal peduncle; depth 2 9/10 to 3⅓; dark green above, whitish below; top of head and snout blackish; pectoral and upper dorsal angle dusky-------------------- **manalak**
  m^4. Scales 15 around caudal peduncle; depth 3½ to 3⅘; black predorsal saddle behind occiput. **herrei**

a^7. Predorsal scales 13.

- n^1. Lower jaw included within upper.
  - o^1 Depth 3½ to 3⅔; scales 26 or 27 in lateral line, 13 around caudal peduncle; light brown above, scales dark edged, below white__ tras
  - o^2. Depth 3¾ to 4½; scales 28 to 32 in lateral line, 12 around caudal peduncle; dusky above, pale or yellowish below; dark lateral band from opercle to caudal________ lindog
- n^2. Lower jaw strongly projects_____________ palata

PUNTIUS HEMICTENUS (Jordan and Richardson)

Barbodes hemictenus JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27, 1907, p. 242, fig. 5, 1908 (type locality: Mindoro).—HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 (reference); Philippine Journ. Sci., vol. 24, p. 282 (Sabaan River; Mamboc River), p. 706, 1924 (reference); vol. 34, p. 303, 1927 (Mindoro).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 42, 1937 (reference).

Depth 2¾ to 3$^1/_{10}$; head 3 to 3⅘. Snout short, rounded; eye 3⅕ to 3⅔ in head, 1 to 1⅐ in snout, 1⅓ to 1⅔ in interorbital; maxillary scarcely reaches eye; mouth rather small, slightly oblique, upper lip protractile, lower jaw included; rostral barbel reaches pupil or beyond, maxillary nearly to or beyond hind preopercle edge; interorbital broad, gently rounded. Pharyngeal teeth 2, 3, 4 or 5–5 or 4, 3, 2, tips slightly hooked.

Scales 24 to 26 in lateral line, 5 above, 3 below, 8 or 9 predorsal, 12 to 14 around caudal peduncle. Ventral axillary scale equals snout. Under lens top of head usually seen covered with minute pores.

D. III, 8, third spine slender, moderately strong, 1 to 1⅕ in head; A. III, 5; caudal broadly and deeply forked; pectoral I, 15, length 1⅓; ventral I, 8, length 1½.

Silvery gray, turning silvery brown. Dark or dusky above, paler on sides, becoming white on abdomen. Dark spot on nape. Large circular blackish spot on side of caudal peduncle before caudal fin. Traces of 1 or 2 dark spots along median lateral line and 1 below front part of dorsal base. Lower side of caudal peduncle more or less yellow, color extending upward across caudal peduncle behind black caudal spot. Traces of broad dark silver bar more or less evident from shoulder to caudal spot. Fins colorless, rays more or less dusky, in young tips of dorsal, anal and caudal dusky to black. Sometimes scales of dorsal half with traces of bluish or violet reflections. Length, 110 mm. (Seale; Herre).

Balabac, Palawan, Busuanga.

PUNTIUS IVIS (Seale)

Barbus ivis SEALE, Philippine Journ. Sci., vol. 4, p. 494, pl. 1, 1909 (type locality: Balabac Island, Philippines).

Barbodes ivis Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 2569, 1924 (Palawan; Balabac; Busuanga); Philippine Journ. Sci., vol. 24, p. 283, 1924 (type: Paracan, Concepcion; Langbuan; Malampaya Sound); Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Concepcion; Culion).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 42, 1937 (reference).

Depth $2\frac{1}{10}$ to $2\frac{3}{5}$; head $3\frac{1}{2}$ to $3\frac{4}{5}$. Snout 4 in head, broad, rather pointed, tip rounded and blunt; eye $3\frac{3}{5}$ to 4, $1\frac{1}{5}$ in snout, $1\frac{1}{2}$ to $1\frac{3}{5}$ in interorbital; maxillary reaches $\frac{1}{5}$ in eye; length 3 in head; mouth small subterminal, slightly oblique, lower jaw included; lips rather thin, upper strongly protractile; barbels rather slender, long upper reaching front edge or center of eye, lower sometimes beyond hind preopercle edge; interorbital nearly or quite flat. Pharyngeal teeth 2, 3, 5 or 3, 3, 5–5, 3, 2, or 5, 3, 3.

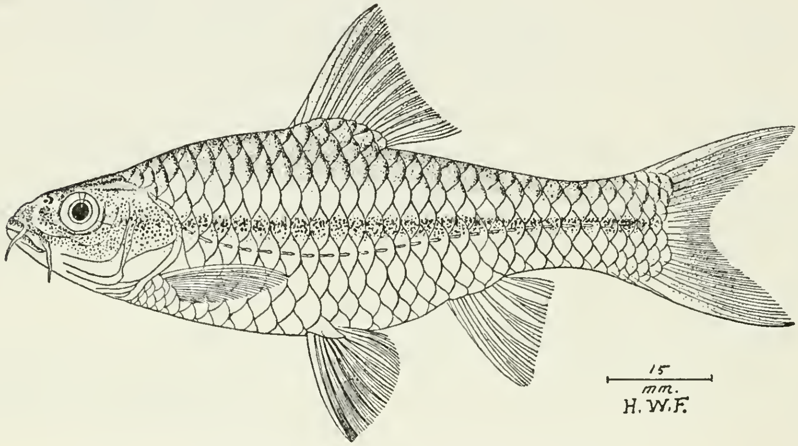

Figure 19.—*Puntius tumba* (Herre): Specimen from Lake Lanao.

Scales 23 to 25 in lateral line; 5 above, 3 below, 8 predorsal, 12 around caudal peduncle.

D. IV, 8, fourth spine stout, more than $1\frac{1}{3}$ in head; A. iii, 5, third simple ray $1\frac{1}{2}$; caudal deeply and broadly notched, 3 in rest of body; least depth of caudal peduncle $1\frac{3}{5}$; pectoral $1\frac{1}{4}$; ventral $1\frac{2}{5}$.

Dorsal region and top of head blackish, merging to dark olive-brown on sides, underparts paler or yellowish. Broad black band from shoulder to base of caudal peduncle. Large, more or less circular black spot on middle of side of caudal peduncle just before caudal fin. More or less evident black blotch on each side forward part of dorsal base. Line of minute specks forms dark margin to scales on sides. Fin rays more or less faintly dusky. Length, 100 mm. (Herre.)

Rivers on north coast of Mindoro.

PUNTIUS TUMBA (Herre)

Figure 19

Barbodes tumba Herre, Philippine Journ. Sci., vol. 24, No. 3, p. 285 (type locality: Srivagat River; Lake Uyaan; Lake Nunungan; outlet of Lake Dapao), p. 706, 1924 (Lanao Plateau, Mindanao); Fishes Herre Philippine Exped. 1931, p. 22, 1934 (outlet to Lake Dapao; Dansalan).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 43, 1937 (reference).

Depth $2\frac{4}{5}$ to $3\frac{2}{5}$; head $3\frac{1}{3}$ to $3\frac{1}{2}$, width $1\frac{4}{5}$ to 2. Snout $3\frac{1}{8}$ to $3\frac{1}{4}$ in head; eye $3\frac{3}{5}$ to $4\frac{2}{5}$, $1\frac{1}{10}$ to $1\frac{2}{5}$ in snout, $1\frac{1}{3}$ to $1\frac{3}{4}$ in interorbital; maxillary reaches $\frac{4}{5}$ to eye, length $3\frac{2}{5}$ to $3\frac{1}{2}$ in head; lower jaw slightly shorter than upper; front barbel 4 to $5\frac{1}{2}$ in head, hind barbel $3\frac{1}{8}$ to $4\frac{1}{5}$; interorbital $2\frac{4}{5}$ to 3, broadly convex; suborbitals cover $\frac{1}{3}$ to $\frac{2}{5}$ of cheek. Gill rakers 2+10, lanceolate, $2\frac{1}{2}$ in gill filaments, which nearly equal eye. Pharyngeal teeth 2, 3, 5–5, 3, 2, with small terminal hooks and grinding surfaces.

Scales 23 or 24 in lateral line to caudal base and 2 more on latter; 5 above, 3 below, 9 predorsal, 13 around caudal peduncle. Scales with 6 or 7 basal and 9 or 10 apical radiating striae, latter imperfect; circuli finely concentric and imperfect apically.

D. IV, 8, I, fourth spine osseous, enlarged, terminally hind margins with fine serrae, first branched ray $1\frac{1}{5}$ to $1\frac{1}{3}$ in head; A. III, 5, I, first branched ray $1\frac{3}{5}$ to 2; least depth of caudal peduncle 2 to $2\frac{1}{8}$; pectoral $1\frac{2}{5}$ to $1\frac{3}{5}$; ventral $1\frac{1}{3}$ to $1\frac{1}{2}$; caudal $2\frac{7}{8}$ to $3\frac{1}{8}$ in rest of body.

Back brownish, sides and lower surfaces whitish, with silvery reflections. Iris silvery white. Barbels pale. Leaden or gray axial line to caudal base medially where little expanded as grayish ill-defined blotch. Fins all uniformly pale, dorsal and caudal little grayish.

Lanao Plateau, Mindanao.

42 examples. Vicar Landing, Lake Lanao. May 22, 1908. Length, 54–114 mm.

PUNTIUS QUINQUEMACULATUS (Seale and Bean)

Barbus quinquemaculatus Seale and Bean, Proc. U. S. Nat. Mus., vol. 33, p. 229, fig. 1, 1907 (type locality: Zamboanga).

Barbodes quinquemaculatus Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 (reference); Philippine Journ. Sci., vol. 24, No. 3, p. 288 (near Zamboanga; Caldera Bay; Basilan); p. 706, 1924 (reference); Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Zamboanga).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 42, 1937 (reference).

Barbus maculatus (not Van Hasselt) Günther, Rep. Voy. *Challenger*, vol. 1, pt. 4, p. 53, 1880 (Pasamanca near Zamboanga).

Depth $2\frac{2}{3}$ to 3; head $3\frac{1}{3}$ to $3\frac{2}{3}$, width $1\frac{2}{3}$ to $1\frac{4}{5}$. Snout 3 to $3\frac{1}{8}$ in head; eye 3 to $4\frac{1}{5}$, greater than snout in young to $1\frac{1}{2}$ with age, 1⅗ to 2 in interorbital; maxillary reaches ⅘ or to eye, length 3 to 3⅔ in head; front barbel 3 to 3⅕, hind barbel 2⅓ to 2⅗; interorbital 2⅕ to 2¼, broadly convex; suborbitals cover ⅓ to ⅗ of cheek. Gill rakers 3+6 or 7, lanceolate, short, ⅓ of gill filaments, which nearly equal eye. Pharyngeal teeth 2, 3, 5–5, 3, 1, little hooked, with moderate grinding surfaces.

Scales 22 to 24 in lateral line to caudal base and 3 more on latter; 5 above, 3 below, 10 predorsal, 12 or 13 around caudal peduncle. Scales with 4 to 12 basal radiating striae and 12 to 24 apically; circuli fine, concentric, imperfect apically.

D. IV, 8, I, fourth spine ossified, hind edges serrate, first branched ray 1⅛ to 1⅕ in head; A. III, 5, I, first branched ray 1⅗ to 1⅔; least depth of caudal peduncle 1¾ to 1⅘; pectoral 1⅕ to 1⅘; ventral 1¼ to 1⅓; caudal 2⅔ to 3 in rest of body, lobes pointed, fin deeply forked.

Back olive-brown, sides and under surface whitish. Each scale on back with dark margins. Iris whitish. Along middle of side 4 black blotches, first rather indistinct and on third or fourth scales from shoulder, second below dorsal origin, third below last dorsal ray and fourth at middle of caudal base. Small blackish spot close below spinous dorsal origin. Very faint small gray spot close above anal base. Dorsal and caudal, also pectoral, brownish. Ventrals and anal whitish, hind anal margin dusky.

Philippines.

333 examples. Malbato River, Port Uson, Busuanga Island. December 17, 1908. Length, 27–163 mm. All have four black blotches or spots axially on sides, though variable. Quite frequently one or more may be double, often only on one side of the body, occasionally the third blotch is absent and sometimes there is an additional blotch at the anal base. Further small examples often have additional black spots due to parasites. These are nearly always more sharply defined and frequently have a raised or swollen appearance.

PUNTIUS BINOTATUS (Valenciennes)

Figures 20–23

Barbus binotatus (Kuhl and Van Hasselt) Valenciennes, Hist. Nat. Poiss., vol. 16, p. 168, 1842 (type locality: Java).—Günther, Cat. Fish. Brit. Mus., vol. 7, p. 123, 1868 (Amboyna).—Vaillant, Nouv. Arch. Mus. Hist. Nat., Paris, ser. 3, vol. 5, p. 79, 1893 (Kapoas, Borneo).—Herre, Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Cotabato; Fort Pikit; Upi; Baldat; Tawi Tawi).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 41, 1937 (reference).—Fowler, List Fish. Malaya, p. 59 (252), 1938.

Barbodes binotatus Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 500, 1904 (Padang).—Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 (all Mindanao except Lanao plateau); Philippine Journ. Sci., vol. 24, p. 290, 1924 (Lake Buluan; Ugalingan Piang's landing; Kidpauan; Kamausa; Cagayan de Misamis; Lindabo, Mailag; Santa Fé; Kolambugan; Talacogan; Puerto Princesa; Taytay; Basilan; Tawi Tawi).

Puntius binotatus Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 3, p. 186, fig. 74 (variation), 1916 (Sumatra, Nias, Java, Borneo).

Barbus maculatus Van Hasselt, Bull. Sci. Nat. Ferrusac, vol. 2, p. 375, 1824 [type locality: Buitenzorg (no description)].—(Kuhl and Van Hasselt) Valenciennes, Hist. Nat. Poiss., vol. 14, p. 195, 1839.—Günther, Rep. Voy. *Challenger*, Zool., vol. 1, pt. 6, p. 53, 1880 (Mindanao).

Puntius (*Barbodes*) *maculatus* Bleeker, Atlas Ichth. Ind. Néerland., vol. 3, p. 104, pl. (34) 135, fig. 1, pl. (40) 141, fig. 1, pl. (43) 144, fig. 6, 1863 (Java, Sumatra, Borneo, Biliton, Banka, Singapore, Bali, Nias).

Barbus oresigenes Bleeker, Verh. Batav. Genootsch. (Mid. Oost Java), vol. 23, p. 17, 1850 (type locality: Patengan, Dieng, Ambarawa, in mountain lakes).

Barbus blitonensis Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 96, 1852 (type locality: Blitong, in River Tjirutjup).

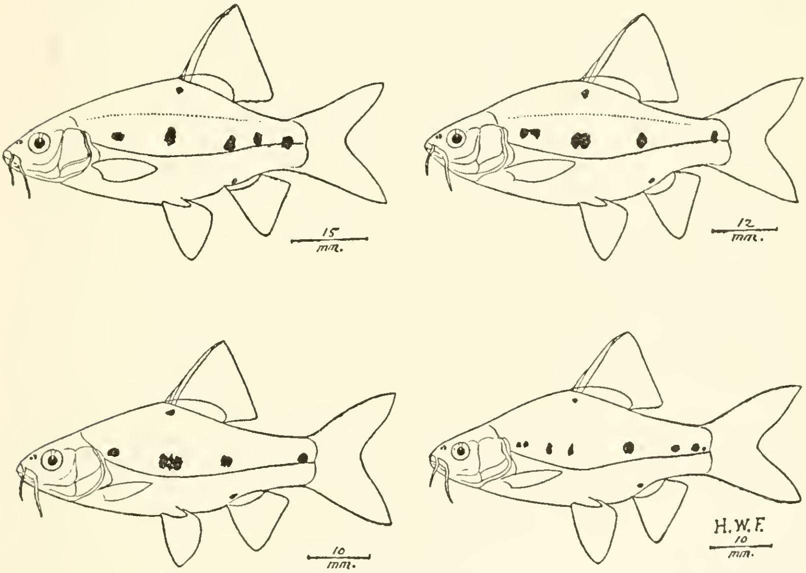
15 mm.
12 mm.
10 mm.
H.W.F.
10 mm.

Figure 20.—*Puntius binotatus* (Valenciennes): Variation; specimens from Malbato River, Busuanga.

Barbus kusanensis Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 429, 1852 (type locality: Prabukarta, South East Borneo, in River Kusan).

Barbus polyspilos Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 13, p. 351, 1857 (type locality: Perdana, Tjibiliong, province of Bantam in West Java, in rivers).

Barbus palavanensis Boulenger, Ann. Mag. Nat. Hist., ser. 6, vol. 15, p. 186, 1895 (type locality: Palawan).

Barbodes binotatus var. *palavensis* Herre, Proc. Pan Pacific Sci. Congress, Australia, vol. 2, 1923, p. 1569, 1924 (reference); Philippine Journ. Sci. vol. 24, p. 706, 1924 (reference).

Barbodes binotatus palavensis Herre, Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Culion; Concepcion; Busuanga).

Barbus snyderi (not Oshima) Fowler and Bean, Proc. U. S. Nat. Mus., vol. 62, p. 7, 1922 (Zamboanga).

Barbodes snyderi Herre, Proc. Pan Pacific Sci. Congress, Australia, vol. 2, 1923 p. 2569, 1924 (Lanao Plateau, Mindanao).

Depth 2⅔ to 3⅓; head 2⅘ to 3½, width 1⅔ to 1¾. Snout 2⅘ to 3⅔ in head; eye 2⅘ to 4⅞, greater than snout in young to 2 in snout with age, greater than interorbital in young to 2 in interorbital with age; maxillary reaches opposite front eye edge, length 3 to 3⅕ in head; front barbel 3½ to 4½ in head, often absent in young; mandible slightly included in upper jaw; hind barbel 2½ to 3⅞; interorbital 2⅖ to 3, broadly convex; suborbitals cover ¼ to ½ of cheek. Gill rakers 2+9, short points, ½ of gill filaments, which 1⅓ in eye. Pharyngeal teeth 2, 3, 5–5, 3, 2, hooked, rather broad grinding surfaces on some of larger ones.

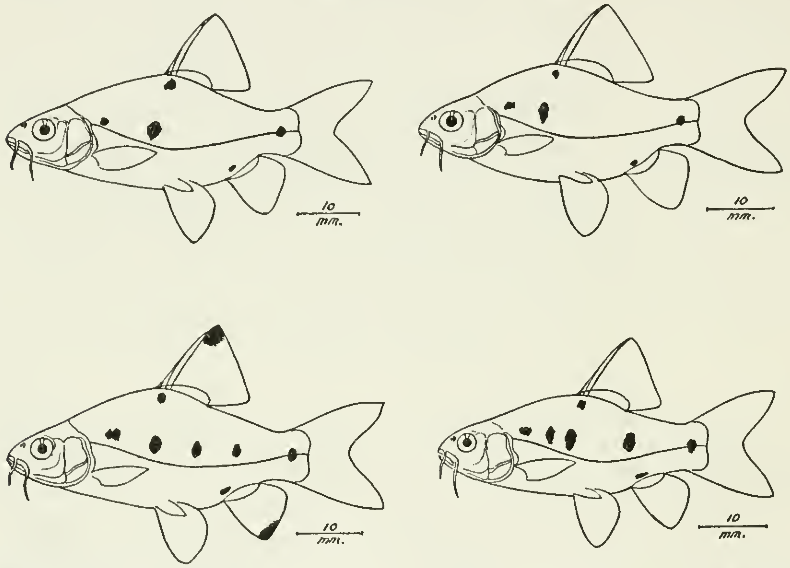
10 mm.
10 mm.
10 mm.
10 mm.

Figure 21.—*Puntius binotatus* (Valenciennes): Variation; specimens from Malbato River, Busuanga.

Scales 22 or 23 in lateral line to caudal base and 2 or 3 more on latter; 4 or 5 above, 3 below, 9 or 10 predorsal, 12 around caudal peduncle. Scales with many as 57 radiating marginal striae, medially reticulated; circuli fine.

D. IV, 8, i, first 2 spines short, rudimentary, fourth with hind edges for terminal half of osseous portion minutely serrated, first branched ray 1½ to 1¾ in head; A. iii, 6, i, first branched ray 1¾ to 1⅞; least depth of caudal peduncle 1¾ to 2; pectoral 1⅕ to 1⅖; ventral 1⅖ to 1½; caudal 3 to 3⅛ in rest of body, deeply forked, lobes broad and pointed.

Generally brown above, under surfaces whitish. Edge of each scale of back and sides darker brown than rest of body. Along middle of side usually 4 variable blackish blotches, usually as 1 behind shoulder, second above ventral, third above anal and fourth at caudal base. Also below front of dorsal high on back and often another on body close above front of anal base. All these markings very variable, in young examples the medial row, are joined variously, sometimes as a medial blackish lateral band. Dorsal, caudal, and pectorals more or less brownish. Ventrals and anal whitish.

Malacca, Singapore, East Indies.

21 examples. Bagaong River, 4 miles from mouth, Sablayan Bay, Mindoro. December 13, 1908. Length, 33–63 mm. All with only black spot at caudal base, no other spots.

32 examples. Creek at Hacienda below Pancol, Malampaya Island, Palawan. December 26, 1908. Length, 38–160 mm. Most with large dark blotches.

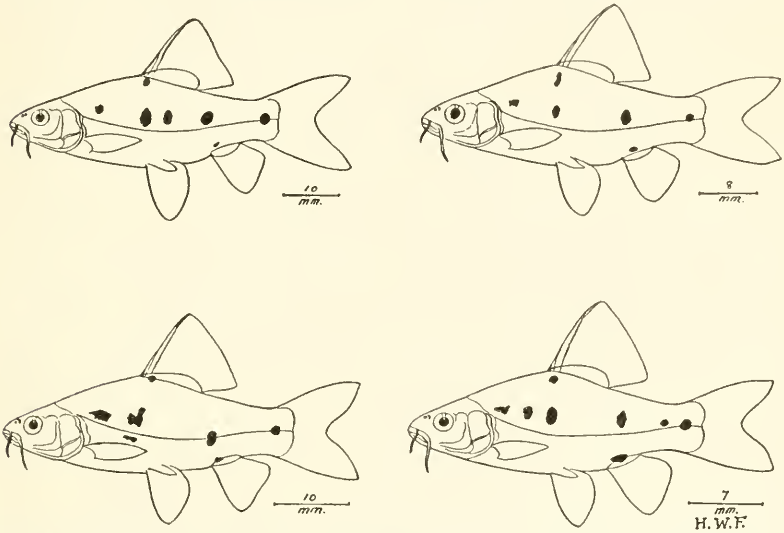
10 mm.
8 mm.
10 mm.
7 mm.
H.W.F.

FIGURE 22.—*Puntius binotatus* (Valenciennes) : Variation; specimens from Malbato River, Busuanga.

7109 to 7111, 7113, 7114, 10798 to 10801, 13961 to 13963. Isabela River, Basilan Island. September 11, 1909. Length, 53–198 mm. 40 examples. Dark blotches all more or less distinct.

5838 to 5841. Iwahig River, Puerta Princesa, Palawan. April 4, 1909. Length, 38–193 mm. 29 examples. All with distinct though variable large black blotches, anal blotches sometimes small, indistinct or absent.

62 examples. Lake Lanao, Vicar Landing, Mindanao. May 23, 1908. Length, 33–89 mm. All very similar and differ from all the other series in their coloration, which more resembles Weber and Beaufort's figures. They usually show a more or less underlaid or leaden streak from the suprascapula to the caudal base medially, where always a blackish spot. In this line usually a spot above pectoral ill defined, often as a horizontal bar, often 2 spots below dorsal and frequently 2 behind dorsal. Spot at dorsal base and at anal base not always present. The spots all vary greatly, even on different sides of same specimen. They seem to have a more or less uniform pattern and seem different from the rest of my series. Known to the Moros as "Odan".

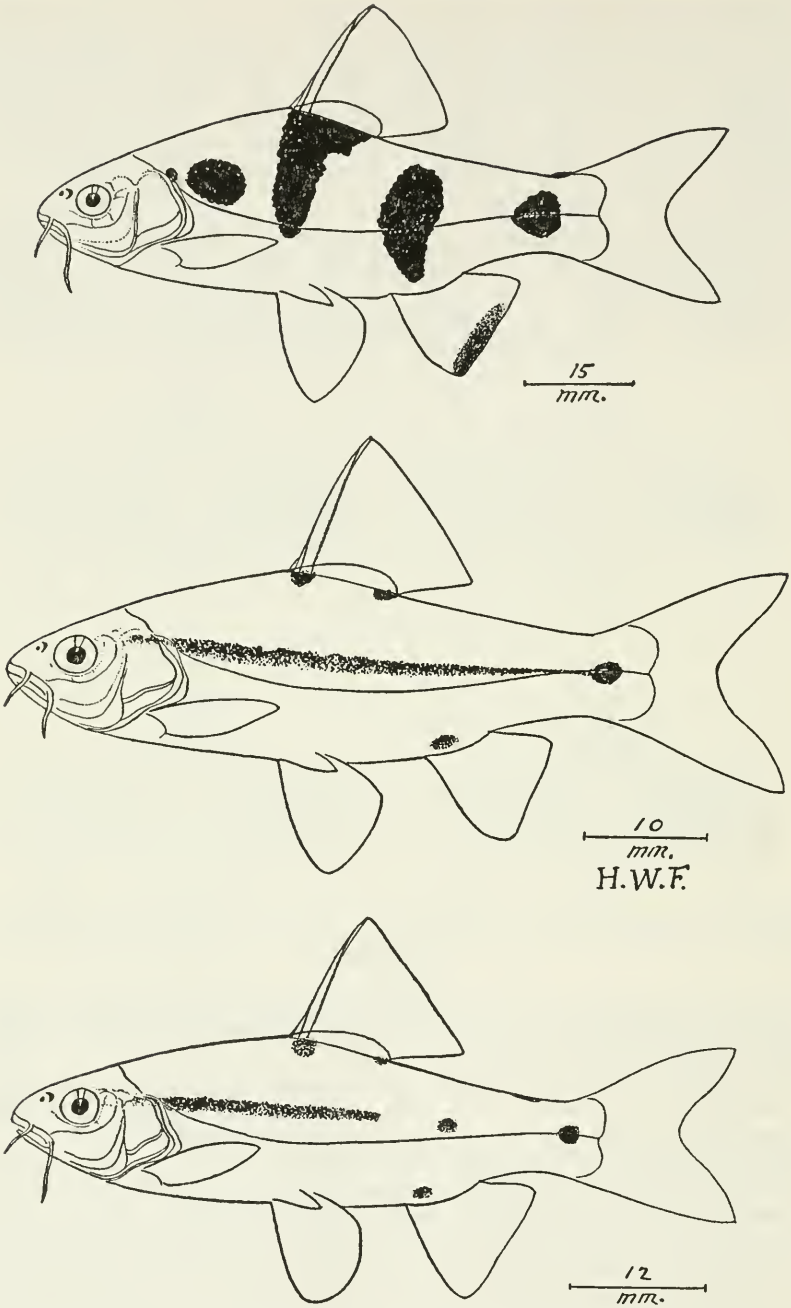

FIGURE 23.—*Puntius binotatus* (Valenciennes): Variations: Upper—specimen from Matatagao and Canino Rivers, Palawan; two lower specimens from Lake Lanao.

106 young examples. Lake Lanao, Vicar Landing. May 23, 1908. Length, 17–38 mm.

5835. Mahinog, Camiguin Island. August 3, 1909. Length, 95 mm.

6325, 6328 to 6331, 6333 to 6336, 6339 to 6342. Malatgao and Camino River, Puerta Princesa, Palawan. April 4, 1909. Length, 60–193 mm. The black blotches are largest in some of these specimens and the anal spot seldom faint. A few show large dark blotches with dorsal blotch joined with second median lateral blotch and third lateral blotch divided or joined with anal blotch.

1 example. Malbato River, Port Uson, Busuanga Island. December 17, 1908. Length, 33 mm.

4910, 18938 to 18942. Malinao River, Mantaquin Bay, Palawan. April 2, 1909. Length, 60–208 mm. 41 examples.

18 examples. Nonucan, Camp Operton, Mindanao. August 6, 1909. Length, 82–135 mm.

12 examples. Pancol, Palawan. December 25, 1908. Length, 98–142 mm. All show dark blotches quite large. One with second axial lateral blotch absent on left side, present on right side.

9130 to 9147. Pangauron River, Port Caltom, Busuanga Island. December 16, 1908. Length, 42–180 mm. Many with only very faint traces of 4 dark axial lateral spots, more distinct in some young. 62 examples.

18973. Quinalasag Island, Masamat Bay. June 12, 1909. Length, 190 mm.

9222 to 9230. Zamboanga River, Zamboanga. October 9, 1909. Length, 27–184 mm. 34 examples. Third lateral spot sometimes absent.

304 examples. Zamboanga Canal. October 8, 1909. Length, 22–155 mm.

14 examples. U.S.N.M. Zamboanga, in fresh water. Dr. Fred Baker. Length, 30–67 mm.

A.N.S.P. Nos. 27388–27400, 27403. Padang, Sumatra. A. C. Harrison and H. L. Hiller. Length, 37–131 mm. Depth 2½ to 4; head 3⅛ to 3⅞. Snout 2⅞ to 3½ in head; eye 2⅘ to 4½; maxillary 3 to $3\frac{2}{7}$; interorbital 2⅖ to 3. Scales 22 to 24 in lateral line to caudal base and 2 or 3 more on latter; 5 above, rarely 4; 3 below; 10 predorsal, vary 9 of 11. D. III, 8, I, rarely III, 6, I. Dull olive brown above, when fresh in arrack, inclined whitish below with silvery. Head silvery below. Dorsal and caudal olive brown, fins medially greenish yellow. Black spot below front of dorsal close to base, another on caudal peduncle side near caudal. Some examples show pale brick red blotches on head below, on cheeks, above pectoral base and over most of lower surface. Many have dark brown about margins of vertical fins.

1 example A.N.S.P. Kapuas, Borneo. M. Chaper.

The following variants, with dark blotches variable, some as very large black bars irregular or unusual:

5834. Iwahig River and tributaries. April 4, 1909. Length, 56 mm.

6326, 6327, 6332, 6337, 6338. Malatgao and Camino River, Puerta Princesa, Palawan. April 4, 1909. Length, 121–153 mm. Pectoral ends in filament nearly long as eye.

PUNTIUS MONTANOI Sauvage

Puntius montanoi Sauvage, Bull. Soc. Philomath., Paris, ser. 7, vol. 5, p. 103, 1881 (type locality: Simulao River, tributary Agusan, Mindanao).

Barbodes montanoi Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 (Simulao River, Agusan Province, Mindanao); Philippine Journ. Sci., vol. 24, p. 292 (compiled), p. 706, 1924 (reference).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 42, 1937 (reference).

Depth $3\frac{1}{2}$ in total length; head $4\frac{1}{2}$. Snout obtuse, without pores; eye $3\frac{1}{2}$ in head, 1 in snout, $1\frac{1}{2}$ in interorbital; lips thick; 4 barbels, maxillary pair longer.

Scales 26 in lateral line; 5 above, 3 below.

D. 11, third spine bony, smooth, nearly long as head without snout; A. 7; caudal forked; ventrals little nearer pectoral origin than anal.

Brown on back. Along lateral line 4 large black spots uniting in an obscure band. Length, 90 mm. (Sauvage.)

Simulao River, central Mindanao.

PUNTIUS CLEMENSI (Herre)

Barbodes clemensi Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 [type locality: Lake Lanao, Mindanao (no description)]; Philippine Journ. Sci., vol. 24, p. 293 (Dansalan; Lake Lanao), p. 706, 1924 (reference); Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Lake Lanao).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 41, 1937 (reference).

Depth 3 to $3\frac{1}{3}$; head $3\frac{1}{10}$ to $3\frac{3}{5}$. Snout $3\frac{1}{5}$ to 4 in head, broad, with prominent median protuberance; eye $6\frac{1}{10}$ in head, $1\frac{3}{5}$ to $1\frac{4}{5}$ in snout, $1\frac{1}{2}$ to $2\frac{1}{10}$ in interorbital; mouth terminal, moderate, slightly oblique; lower jaw short, usually included, comparatively narrow; rostral barbels equal or slightly longer than eye, maxillary little longer; interorbital gently rounded or nearly flat. Pharyngeal teeth 2, 3, 5–5, 3, 2.

Scales 22 to 34 in lateral line; 5 above, 3 below, predorsal 8 or 9, 11 around caudal peduncle. Lateral line rather faint, descends abruptly till opposite dorsal origin then nearly straight and median along tail.

D. IV, 8, fourth spine stout, feebly serrated along upper half of bony portion, spine $1\frac{2}{5}$ to $1\frac{3}{5}$ in head; A. iii, 5; caudal deeply forked, with pointed lobes, $\frac{4}{5}$ to $\frac{5}{6}$ of head; pectoral I, 15, length $1\frac{1}{3}$; ventral I, 7.

Dark green above when fresh, merging to yellow beneath, with golden or brassy luster on sides and belly. Fins colorless or reddish. Length, 188 mm. (Herre.)

Lake Lanao, Mindanao.

PUNTIUS CATARACTAE (Fowler)

Figure 24

Barbus cataractae Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 280, fig. 40, 1934 (type locality: Cascade River, Murcielagos Bay, Mindanao).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 40, 1937 (reference).

Depth $2\frac{7}{8}$ to 3; head $3\frac{1}{3}$ to $3\frac{3}{4}$, width $1\frac{2}{5}$ to $1\frac{3}{4}$. Snout $3\frac{1}{8}$ to $3\frac{2}{5}$ in head; eye 3 to $3\frac{7}{8}$, greater than snout in young to $1\frac{1}{5}$ in snout with age, 1 to 1⅗ in interorbital; maxillary reaches eye in young, ⅕ in eye with age, length 2⅞ to 3⅛ in head; front barbels 3¼ to 3½, hind barbels 3 to 3⅛; lower jaw slightly included in upper; interorbital 2½ to 2⅗ in head, broadly convex; suborbitals cover ½ of cheek to preopercle ridge. Gill rakers 2+8, short, lanceolate, ⅓ of gill filaments, which 1⅖ in eye. Pharyngeal teeth 2, 3, 5–5, 3, 2, with small terminal hooks, grinding surfaces rather small.

Scales 22 to 24 in lateral line to caudal base and 2 or 3 more on latter; 5 above, 3 below, 7 or 8 predorsal, 12 around caudal peduncle. Scales with 12 to 16 apical and 6 or 7 basal radiating striae; circuli finely concentric, imperfect apically.

D. IV, 8, i, fourth spine slender, firm, with hind edges only very feebly or slightly with minute weak serrae, first branched ray 1⅛ to 1¼ in head; A. iii, 5, i, first branched ray 1⅗ to 1¾; least depth of caudal peduncle 1¾ to 1⅘; pectoral 1⅕ to 1¾; ventral 1⅓ to 1⅖; caudal 2⅖ to 2¾ in rest of body, well forked, rather broad lobes pointed.

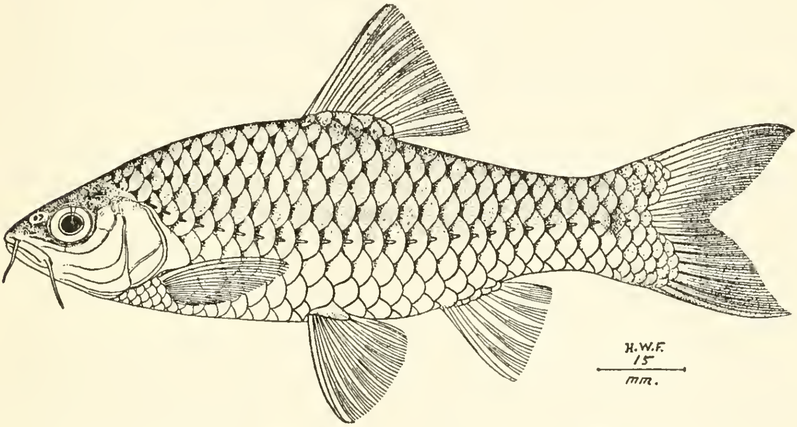

FIGURE 24.—*Puntius cataractae* (Fowler): Type (U.S.N.M. No. 93137).

Back brown, lower sides and under surfaces whitish. Each scale on upper surface of body margined with deep brown. Iris whitish. Base of caudal with obscure gray or light neutral blotch, smaller than eye. Dorsal, caudal, and pectoral pale brownish. Ventral and anal with pale yellowish tint.

Apparently related to *Barbus clemensi* Herre, its 8 predorsal scales in agreement. It differs in that some examples show 2 or 3 very indistinct or subdued dusky axial blotches, of which last most distinct and possibly due to or rendered visible by long preservation in alcohol. In the type only the last blotch evident. Fins evidently yellow, as still golden in color.

U.S.N.M. No. 93137. Cascade River, Murcielagos Bay, Mindanao, August 20, 1909. Length, 135 mm. Type.

27 examples. Cascade River, Murcielagos Bay, Mindanao. August 20, 1909. Length, 50–135 mm.

PUNTIUS AMARUS (Herre)

Barbodes amara Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, p. 1569, 1923 [type locality: Lake Lanao, Mindanao (no description)]; Philippine Journ. Sci., vol. 24, p. 295 (Dansalan, Lake Lanao, Mindanao), p. 706, 1924 (reference); Fishes Herre Philippine Exped. 1931, p. 20, 1934 (Lake Lanao).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 41, 1937 (reference).

Depth 3⅕ to 3⅗, trifle more or less than head; body rather elevated, much compressed, especially posterior half, with narrow little rounded abdomen. Snout rather pointed, with median hump and 2 smaller lateral ones, subequal with eye; eye 3⅕ to 4 in head, little less than interorbital; maxillary not reaching eye; mouth terminal, very oblique, upper lip thin, very protractile, weak lower jaw slightly included, even or somewhat projecting, with thin lip and small knob projecting from outer side of symphysis; rostral barbels usually less than eye, rarely equal, maxillary somewhat larger or little over eye; interorbital flat, with low median ridge. Pharyngeal teeth 2, 3, 5–5, 3, 2, crooked tips hooked.

Scales 22 to 26 in lateral line; 5 or 4 above, 2 or 3 below, 9 predorsal, 11 around caudal peduncle. Scales with conspicuous longitudinal radiating striae.

D. IV, 8, fourth spine 1⅖ to 1⅔ in head, upper half feebly to moderately toothed; A. III, 5, lower than pectoral or not much greater than hard part of dorsal spine; caudal deeply forked, ⅘ to 9/10 in head; least depth of caudal peduncle 2⅖ to 2½; pectoral 1½, rays I, 14; ventral I, 8, origin opposite dorsal origin.

Brownish above, merging into yellowish or whitish on sides and belly, with silvery luster over all. Dark silver band from shoulder to middle of caudal. More or less blackish band from nape to dorsal. Also top of head dark. Fin rays more or less dusky. Lips and snout tip edged black. Outlines of each scale above lateral line marked out by band of very minute black specks. Length, 108 mm. (Herre.)

Lake Lanao, Mindanao.

PUNTIUS FLAVIFUSCUS (Herre)

Barbodes flavifuscus Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 [type locality: Lake Lanao, Mindanao (no description)]; Philippine Journ. Sci., vol. 24, p. 296 (Lumbatan, Lake Lanao), p. 706, 1924 (reference); Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Lake Lanao).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 42, 1937 (reference).

Depth 3 to $3\frac{3}{5}$; head $2\frac{4}{5}$ to 3. Snout elevated or with central hump and 2 smaller lateral ones; eye $4\frac{1}{4}$ to $4\frac{1}{2}$, $1\frac{1}{5}$ to $1\frac{1}{3}$ in snout; mouth large, terminal, little oblique, lips thick, lower jaw included; rostral barbels nearly reach eye or pupil, maxillary reach eye or even to hind eye edge; interorbital $3\frac{1}{3}$ to $3\frac{2}{5}$ in head, equals snout.

Scales 24 to 28 in lateral line; 5 above, 3 below, 9 predorsal, 11 around caudal peduncle.

D. III, 8, third spine rather stout, feebly dentate, 2 in head; A. iii, 5; pectoral i, 15, length $1\frac{7}{10}$ to $1\frac{4}{5}$ in head; ventral i, 7, length 2 to $2\frac{1}{4}$; least depth of caudal peduncle $1\frac{1}{2}$ to $1\frac{3}{5}$.

Very dark blackish brown. Bluish black in alcohol on snout and top of head and blackish brown dorsally, becoming paler brown on sides and yellowish brown on belly. Fins all dusky. Length, 105 mm. (Herre.)

Lake Lanao, Mindanao. Said to resemble *Barbus katolo*, but with shorter paired fins, fewer predorsal scales, and different coloration.

PUNTIUS MANGUAOENSIS (A. L. Day)

Barbus manguaoensis A. L. DAY, Philippine Journ. Sci., vol. 9, p. 189, pl. 1, fig. 3, 1914 (type locality: Lake Manguao, near Taytay, northern Palawan).

Barbodes manguaoensis HERRE, Proc. Pan Pacific Sci. Congress, Australia, vol. 2, 1923, p. 1569, 1924 (Lake Manguao, Palawan); Philippine Journ. Sci., vol. 24, No. 3, p. 297 (type), p. 706, 1924 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull 6, p. 42, 1937 (reference).

Depth $2\frac{3}{4}$ to $3\frac{3}{5}$; head $3\frac{1}{4}$ to 4. Snout broad; eye $3\frac{1}{2}$ to $4\frac{1}{7}$ in head, $1\frac{1}{4}$ to $1\frac{1}{2}$ in snout, $1\frac{1}{3}$ to $1\frac{2}{3}$ in interorbital; mouth very oblique, lower jaw included; rostral barbel equals or very slightly exceeds eye, maxillary $\frac{1}{10}$ to $\frac{2}{7}$ longer than rostral or eye; interorbital 2 to $3\frac{1}{5}$ in head. Pharyngeal teeth 2, 3, 5, 3—3, 5, 3, 2.

D. IV, 8, fourth spine very broad, strong, moderately serrate, about $1\frac{3}{4}$ in head; A. iii, 8; caudal badly damaged; pectoral i, 15, length $1\frac{1}{2}$ to $1\frac{3}{5}$ in head; ventral $1\frac{2}{3}$ to $1\frac{4}{5}$, rays i, 8.

Faded, yellowish brown, darker above. Four black spots on side; largest and most distinct on lateral line on side of caudal peduncle and before caudal base; remaining 3 above lateral line, 1 above anal origin, 1 above ventral origin and elongated above front part of pectoral, all connected by indistinct broad black band. Length, 140 mm. (Herre.)

Lake Manguao, Northern Palawan. Only the type and paratype known.

PUNTIUS SIBUKENSIS, new species

FIGURE 25

Barbus maculatus (not Valenciennes, 1842) VAILLANT, Nouv. Arch. Mus. Hist. Nat., Paris, ser. 3, vol. 5, p. 79, 1893 (Kina Balu).

Barbus elongatus (not Rüppell, 1837) SEALE, Philippine Journ. Sci., vol. 5, p. 265, pl. 2, fig. 1, 1910 (type locality: Sandakan, Borneo).

Puntius elongatus Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 3, p. 191, 1916 (Tidung on River Sibuko, Northeast Borneo).

Depth 2¾ to 3; head 3 to 3⅗, width 1⅖ to 1½. Snout 3¼ to 3⅓ in head; eye 3⅘ to 4⅗, 1⅛ to 1⅖ in snout, 1½ to 1⅗ in interorbital; maxillary reaches ⅞ to or to front eye edge, length 3 to 3½ in head; front barbel 2¾ to 3, hind barbel 2¼ to 2⅖; lower jaw slightly included within upper jaw; interorbital 2⅗ to 2¾, broadly convex; suborbitals ½ to ⅓ of cheek. Gill rakers 3+8, short, lanceolate, 2½ in gill filaments, which 1½ in eye. Pharyngeal teeth 2, 3, 5 — 5, 3, 2, little hooked, with moderate grinding surfaces.

Scales 25 to 27 in lateral line to caudal base and 3 more on latter; 5 or 6 above, 3 below, 8 to 10 predorsal, 16 around caudal peduncle. Scales with 4 or 5 apical and 6 basal radiating striae; circuli finely concentric, imperfect apically.

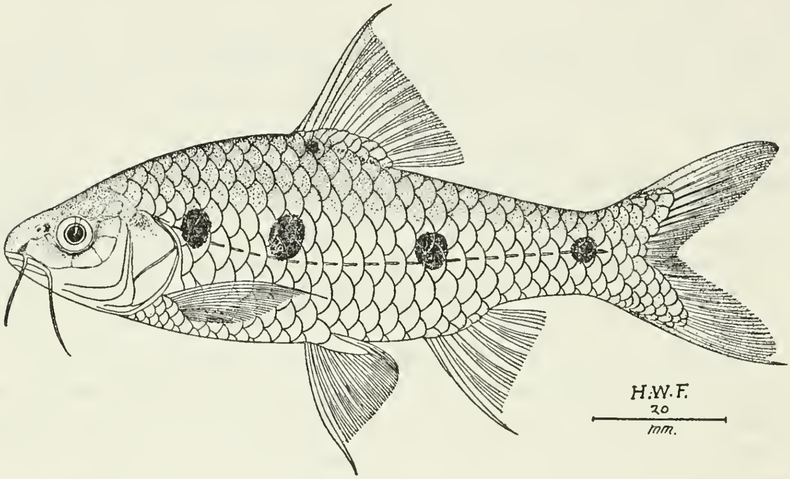

Figure 25.—*Puntius sibukensis*, new species: Type (U.S.N.M. No. 99438).

D. IV, 8, I, fourth spine osseous, with hind edges serrated, first ray 1⅕ to 1⅗ in head; A. III, 5, I, first branched ray 1½ to 1⅗; least depth of caudal peduncle 2 to 2⅓; pectoral 1⅕ to 1½; ventral 1⅓ to 1⅖; caudal 2⅔ to 2¾ in rest of body, moderately forked, lobes pointed.

Back brown, lower sides and under surfaces whitish. Each scale on back with narrow dark brown margin. Sides and under surface of body silvery white. Iris whitish and gray. Four rounded black spots axially on side, first 2 or 3 scales behind humeral region, second below front of dorsal, third above and or about opposite end of depressed dorsal and fourth at caudal base medially. Small black spot on back close below front of dorsal base. Another, usually more or less distinct on body at front of anal base, often strongly contrasted. Vertical fins more or less pale brownish to grayish, paired fins whitish, often anal largely so.

Type.—U.S.N.M. No. 99438, Silimpopon River, Sibuko Bay, Borneo. October 2, 1909. Length, 116 mm.

Diagnosis.—Known by its combination of characters; 16 scales around caudal peduncle; 4 black lateral spots always well contrasted and vary somewhat in size, especially the second enlarged, often the first indistinct, and the third sometimes absent. The black anal spot always small, if often indistinct.

17 examples. Silimpopon River, Sibuko Bay, Borneo. October 2, 1909. Length, 43–116 mm.

11 examples. Sebatic, British North Borneo. October 5, 1909. Length, 44–102 mm. Black spots variable.

PUNTIUS BANTOLENSIS (A. L. Day)

Barbus bantolensis A. L. DAY, Philippine Journ. Sci., vol. 9, p. 188, pl. 1, figs. 1–2, 1914 (type locality: Lake Manguao, near Taytay, in northern Palawan).

Barbodes bantolensis HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 (Lake Manguao, Palawan); Philippine Journ. Sci., vol. 24, p. 298 (type), p. 706, 1924 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 41, 1937 (reference).

Depth $2\frac{1}{2}$ to $3\frac{1}{5}$, oblong elongate, decided hump at nape or upper profile strongly convex; head $2\frac{3}{4}$ to $3\frac{1}{4}$. Snout broad, bluntly rounded; eye $4\frac{1}{5}$ to $5\frac{1}{10}$ in head, $1\frac{2}{5}$ to $1\frac{7}{10}$ in snout, $1\frac{2}{5}$ to $1\frac{9}{10}$ in interorbital; mouth large, terminal, moderately oblique, upper lip projecting slightly beyond included lower lip; rostral barbel stout, $\frac{1}{8}$ longer than eye, reaches front eye edge, maxillary stronger and $1\frac{3}{8}$ times eye, reaches eye center; interorbital wide, nearly flat. Pharyngeal teeth 2, 3, 5, 3–3, 5, 3, 2.

Scales 24 to 26 in lateral line; 5 above, 3 below, 12 around caudal peduncle. Ventral axillary scale $\frac{1}{9}$ to $\frac{1}{7}$ longer than eye.

D. IV, 8, fourth spine strong, $1\frac{3}{5}$ to $1\frac{4}{5}$ in head, osseous part strongly serrate nearly to base; A. III, 5, low, $2\frac{1}{3}$ to $2\frac{3}{5}$; caudal (damaged) broadly forked; pectoral $1\frac{3}{5}$ to $1\frac{4}{5}$; ventral $1\frac{4}{5}$ to $1\frac{9}{10}$.

Brownish yellow, dusky above, paler below to very pale yellowish on belly. Dark spot on nape with more or less evident dark stripe from nape to caudal. Indistinct dark lateral band from shoulder to caudal. Very large dark spot or bar across caudal peduncle near caudal base. Dark elongate blotch behind shoulder. Large dark spot between dorsal origin and ventral, another circular between same and caudal. Fins unmarked. Sometimes dark spot along dorsal base. Length, 124 mm. (Herre.)

Lake Manguao, northern Palawan.

PUNTIUS LANAOENSIS (Herre)

Barbodes lanaoensis Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. **2**, 1923, p. 1569, 1924 [type locality: Lake Lanao, Mindanao (no description)]; Philippine Journ. Sci., vol. 24, p. 300 (Dansalan, Lake Lanao), p. 706, 1924 (reference); Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Lake Lanao).—Roxas and Martin, Departm. Agric. Comm. Manila, Tech. Bull. 6, p. 42, 1937 (reference).

Depth 2⅞ to 3; head 3⅛ to 3⅓, width 2 to 2⅛. Snout 3⅖ to 3½ in head; eye 3⅘ to 4, 1⅕ to 1¼ in snout, 1 to 1⅛ in interorbital; maxillary reaches eye, length 3 to 3⅔ in head; front barbel 3⅛ to 3⅖, hind barbel 2⅖ to 2⅔; lower jaw slightly included in upper; interorbital 3⅕ to 3¼ in head, broadly convex; suborbitals cover ⅓ of cheek to preopercle ridge. Gill rakers 2+6, lanceolate, 2¼ in gill filaments, which 1⅘ in eye. Pharyngeal teeth 2, 3, 5–5, 3, 2, with slight terminal hooks and grinding surfaces.

Scales 22 to 24 in lateral line to caudal base and 2 more on latter; 5 above, 3 below, 9 predorsal, 12 around caudal peduncle. Scales with 8 or 9 imperfect radiating apical striae, none basal; circuli finely concentric, imperfect apically.

D. IV, 8, i, fourth spine osseous, enlarged, with well-developed serrae along hind edges terminally, first branched ray 1⅛ to 1⅕ in head; A. iii, 5, i, first branched ray 2 to 2⅒; least depth of caudal peduncle 2⅖ to 2½; pectoral 1⅖ to 1½; ventral 1⅔ to 1¾; caudal 3¼ to 3⅖ in rest of body, lobes pointed, rather slender, well forked.

Back rather light brown, sides and lower surface silvery white, also sides of head. Iris silvery white. Front barbel grayish above, hind one whitish. Obscure, ill-defined, grayish blotch at caudal base medially. Dorsal, caudal and pectoral grayish, other fins whitish.

Lake Lanao, Mindanao.

5 examples. Vicar market, Lake Lanao, Mindanao. May 23, 1908. Length, 70–81 mm.

PUNTIUS BAOULAN (Herre)

Barbodes baoulan Herre, Philippine Journ. Sci., vol. 29, p. 499, pl. 1, 1926 (type locality: Philippines); Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Lake Lanao).—Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 41, 1937 (reference).

Depth 2⅗ to 3; very broad, deep, nearly arrow-shaped; head 3¼ to 3⅓. Snout 2⅞ to 3⅓ in head; eye 4½ to 5⅔, 1⅓ to 1⅘ in snout; maxillary reaches ⅘ to eye, length 3¼ in head; mouth moderate, slightly inferior, barbels long, rostral reaches hind eye edge or beyond, maxillary beyond hind preopercle edge; interorbital equals snout length, broad, slightly concave.

Scales 24 to 26 in lateral line (last 2 evidently on caudal base); 5 above, 3 below, 9 or 10 predorsal, 12 around caudal peduncle.

D. IV, 7, fourth spine $1\frac{3}{5}$ in head, stout, medium serrate; A. iii, 5, third simple ray 2; caudal deeply forked, lobes pointed, length 3 in rest of body; least depth of caudal peduncle $2\frac{1}{3}$ to $2\frac{2}{5}$ in head; pectoral $1\frac{1}{4}$ to $1\frac{1}{3}$; ventral $1\frac{3}{4}$ to $1\frac{4}{5}$.

Whitish yellow, very pale on throat and belly, sides and back clear golden yellow. Top of head dusky. Lateral blackish blotch on basal scaly dorsal sheath. Fins all pale. In life dorsal and anal, also basal half of caudal, probably golden. Length, 108 mm. (Herre.)

Lake Lanao, Mindanao.

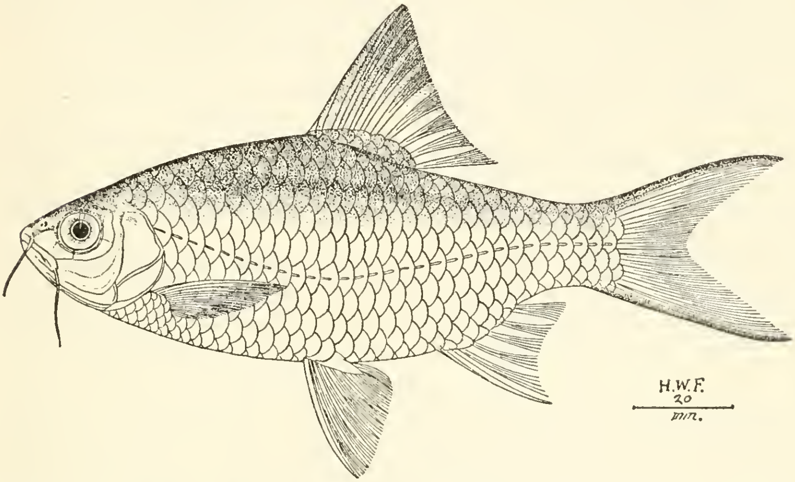

FIGURE 26.—*Puntius collingwoodi* (Günther): Specimen from Tawao River, Borneo.

PUNTIUS COLLINGWOODI (Günther)

FIGURE 26

Barbus collingwoodi GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 483, 1868 (type locality: Sarawak, Borneo).

Puntius collingwoodi WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 3, p. 196, 1916 (Baram River, Senah, Sarawak, Tinjar River).

Barbus strigatus (not Boulenger) VAILLANT, Notes Leyden Mus., vol. 24, p. 98, 1902.

Barbus boulengeri POPTA, Notes Leyden Mus., vol. 25, p. 172, 1904–1905 (type locality: Bongon and Howong, Borneo); vol. 27, p. 132, 1906.

Depth $2\frac{1}{2}$ to 3; head $3\frac{1}{2}$ to 4, width $1\frac{1}{2}$ to $1\frac{2}{3}$. Snout 3 to $4\frac{1}{5}$ in head; eye $2\frac{1}{4}$ to $3\frac{1}{8}$, greater than snout, greater than interorbital in young to $1\frac{1}{4}$ in interorbital with age; maxillary reaches eye, length $2\frac{1}{2}$ to $2\frac{3}{4}$ in head; front barbel 2 to $2\frac{1}{5}$, hind barbel $1\frac{4}{5}$ to 2; lower jaw included in upper, only slightly so in young; interorbital $2\frac{1}{8}$ to $2\frac{1}{2}$, broadly and slightly convex; suborbitals cover about $\frac{1}{3}$ of cheek. Gill rakers 3+8 short points, $2\frac{1}{2}$ in gill filaments, which $1\frac{2}{3}$ in eye.

Pharyngeal teeth 2, 3, 5–5, 3, 2, hooked, with moderate grinding surfaces.

Scales 29 or 30 in lateral line to caudal base and 2 more on latter; 7 above, 4 below, 10 or 11 predorsal, 15 around caudal peduncle. Scales with single basal and 16 apical striae, latter convergent; circuli fine.

D. IV, 8, I, fourth spine with hind edge largely coarsely serrated each side, first branched ray 3⅖ to 3½ in combined head and body to caudal base; caudal 2⅛ to 2⅖, deeply forked, long slender lobes sharply pointed; A. III, 5, I, first branched ray 1⅕ to 1¼ in head, third simple ray firm and with terminal hind edges minutely serrated; least depth of caudal peduncle 1⅔ to 1¾; pectoral 1⅛ to slightly greater than head; ventral 1 to 1¼.

Back light brown, lower sides and under surfaces whitish, with silvery white reflections. Iris silvery white. Fins pale, dorsal dusted with brownish terminally and each caudal lobe above and below marginally brownish. Lower fins paler or with slight yellowish tinge. Barbels pale.

Borneo. Outstanding characters are 3 scales below lateral line to ventral origin and each caudal lobe with submarginal dark band along upper edge of upper lobe and similar one along lower edge of lower lobe.

14 examples. Silimpapon River, Sibuko Bay, Borneo. October 2, 1909. Length, 45–177 mm.

19 examples. Tawao River, Borneo. September 30, 1909. Length, 53–160 mm.

PUNTIUS DISA (Herre)

Barbodes disa HERRE, Copeia, No. 3, p. 140, 1932 (type locality: Dansalan, Lanao Province, Mindanao); Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Lake Lanao).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 41, 1937 (reference).

Depth 3⅘ to 3⁹⁄₁₀; head 3⅘ to 3⁹⁄₁₀. Snout 3⅖ to 3½ in head; eye 4, less than snout or interorbital; maxillary not quite reaching front of eye; mouth oblique, terminal, jaws weak and lower included; small barbels about half an eye diameter in length; interorbital 3⅒ to 3⅗ in head.

Scales 30 in lateral line to caudal base and 2 more on latter, 6 above, 5 below to anal origin, 3 below to ventral origin, 12 predorsal.

D. IV, 8, origin opposite tenth scale of lateral line and trifle anterior to ventral origin, which opposite anterior part of tenth scale, height of fourth dorsal spine equals pectoral or 1⅓ in head; bony portion of fourth dorsal spine serrated behind and ¾ to ⅘ length of entire ray; A. II, 5, deeply forked caudal trifle more or less than head; pectoral rays I, 13 or I, 14, fails to reach ventral base by breadth of 2 scales; ventral I, 7 or I, 8, falls short of reaching anus; least depth of caudal peduncle 2⅖ to 2³⁄₇ in head.

Color in alcohol dusky above, becoming whitish yellow beneath. Broad blackish stripe from opercular angle to middle of caudal base and blackish transverse band midway between first dorsal and nape, connecting 2 lateral stripes. Anal and ventrals yellowish, other fins more or less dusky.

Length, 82 mm. (Herre.)

Philippines.

PUNTIUS KATOLO (Herre)

Barbodes katolo HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 [type locality: Lake Lanao, Mindanao (no description)]; Philippine Journ. Sci., vol. 24, p. 301 (Dansalan, Lake Lanao); p. 706, 1924 (reference); Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Lake Lanao).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 42, 1937 (reference).

Depth 3⅓ to 3⅗; head 2⅗, thick, clumsy, very long. Snout 3 in head, long, broad, blunt; eye 4½ to 5, 1½ in snout; mouth rather large, terminal, oblique, lower jaw included; upper lip protractile, moderately thick and lower thicker, with lateral flaplike extensions below; barbels rather weak, short, rostral ½ to ¾ of eye and not reaching eye, maxillary reaches pupil and ¾ of eye; interorbital greater than eye, not long as snout.

Scales 26 in lateral line; 5 above, 3 below, 11 predorsal, 11 around caudal peduncle.

D. IV, 8, fourth spine medium, weakly serrate, 2 in head; A. III, 5, height ¾ of dorsal; caudal broadly and deeply notched, upper lobe narrower and more pointed, little less than 3 in rest of body; pectoral I, 15, length 1⅘ to 1⁹⁄₁₀ in head; ventral 2¹⁄₁₀ to 2⅕.

Yellowish brown, dorsal region slightly dusky, top of head brown. Fins pale brown. Length, 110 mm. (Herre.)

Lake Lanao, Mindanao. Said to resemble *Cephalkompsus pachycheilus*, but without continuous postlabial groove across chin, thinner nonrugose lips, smaller barbels and longer paired fins.

PUNTIUS MANALAK (Herre)

Barbodes manalak HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 [type locality: Lake Lanao, Mindanao (no description)]; Philippine Journ. Sci., vol. 24, No. 3, p. 302 (Dansalan, Lake Lanao), p. 706, 1924 (reference); Fishes Herre Philippine Exped. 1931, p. 2, 1934 (Lake Lanao).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 42, 1937 (reference).

Depth 2⁹⁄₁₀ to 3⅓; head 2⁹⁄₁₀ to 3⅓. Snout 3 to 3⅗ in head, wide, without prominent protruberances; eye 5 to 6, 1⅖ to 2 in snout, 1⅘ to 2 in interorbital; mouth wide, oblique, subterminal; lower jaw strong, broad, rounded, prominent, more or less projecting; upper lip moderately protractile; rostral and maxillary barbels short, length from ½ to 1 eye diameter; interorbital broad, gently curved from side to side or flat. Pharyngeal teeth 2, 3, 5 - 5, 3, 2, all more or less hooked at tips, with age sometimes worn as truncate cylinders.

Scales 24 to 26 in lateral line; 6 above, 4 below, 11 predorsal, 13 around caudal peduncle. Lateral line conspicuous, gently curved toward belly in forward half.

D. IV, 8, fourth spine smooth or nearly so and comparatively slender, 1⅘ to 2 in head; A. iii, 5, truncate, height equals or ¼ less dorsal height; caudal ⅔ to 9/10 of head, deeply forked, lobes pointed; pectoral i, 15, length 1⅖ to 1½; ventral i, 7 or 8, length 2 to 2⅒.

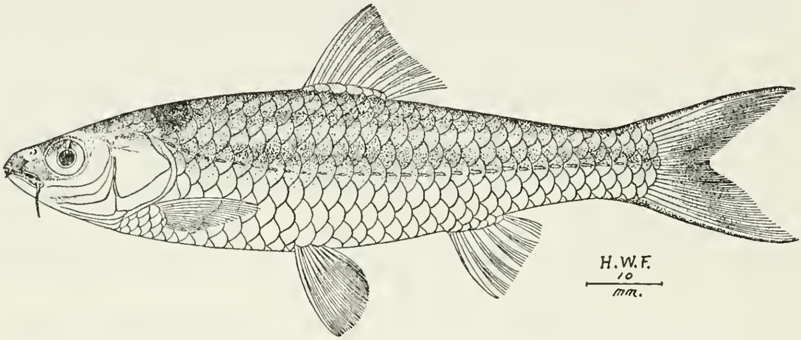

FIGURE 27.—*Puntius herrei* (Fowler) : Type (U.S.N.M. No. 93138).

Dorsal surface dark green, changing to pale or whitish on sides and overcast with brassy or golden, especially on belly. Top of head and snout blackish, with pearly epidermal spots and also on suborbital and opercle. Length, 315 mm. (Herre.)

Lake Lanao.

PUNTIUS HERREI (Fowler)

FIGURE 27

Barbus herrei FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 280, fig. 41, 1934 (type locality: Vicar market, Lake Lanao, Mindanao).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 40, 1937 (reference).

Depth 3½ to 3⅘; head 3⅗ to 3¾, width 2 to 2⅛. Snout 3⅗ to 4⅒ in head; eye 3⅘ to 4¼, 1 to 1⅛ in snout, 1⅓ to 1½ in interorbital; maxillary largely concealed, reaches eye, length 3⅓ to 3⅞ in head; front barbel 2⅕ to 2⅘ in eye, hind barbel 4½ to 4⅘ in head; lower jaw slightly included within upper; interorbital 3 to 3⅕ in head, convex; suborbitals cover half of cheek to preopercle ridge. Gill rakers 3+12, short, lanceolate, 2½ in gill filaments, which 1⅓ in eye. Pharyngeal teeth 2, 3, 5–5, 3, 2, slightly hooked, each with slight grinding surfaces, both bones and teeth small.

Scales 28 or 29 in lateral line to caudal base and 2 or 3 more on latter; 5 above, 3 below, 10 or 11 predorsal, 15 around caudal peduncle. Scales all well exposed, little imbricated. Scales with 8 to 11 basal and 5 to 8 apical radiating striae, latter very imperfect or obsolete; circuli concentric, fine, imperfect apically.

D. IV, 8, I, third ray firmly osseous though slender, hind edges for ⅔ terminally serrate, first branched ray 1⅓ to 1⅔ in head; A. III, 5, I, first branched anal ray 2 to 2¼; least depth of caudal peduncle 2⅕ to 2½; pectoral 1⅕ to 1⅗; ventral 1½ to 1⅔; caudal 3⅛ to 3⅖ in rest of body, well forked, lobes rather slender and sharply pointed.

Back brown, sides more or less gray white and under surfaces whitish. Contrasted blackish predorsal saddle at least 2 scales in width, above gill opening. Iris whitish, gray above. Barbels dark or dusky. Dorsal and caudal grayish, lower fins whitish.

U.S.N.M. No. 93138. Vicar market, Lake Lanao, Mindanao. May 23, 1908, Length, 110 mm. Type. Known by its front barbel very short, greatly less than eye and the black predorsal saddle behind the occiput.

5 examples. Vicar market, Lake Lanao, Mindanao. May 23, 1908. Length, 94–110 mm. Paratypes.

PUNTIUS TRAS (Herre)

Barbodes tras HERRE, Philippine Journ. Sci., vol. 29, No. 4, p. 501, pl. 2, 1926 (type locality: Datu Samba-an, at Camp Keithley, Lanao).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 43, 1937 (reference).

Depth 3½ to 3⅔; head 2⅘ to 2⅞. Snout 3⅕ to 3¼ in head; eye 4 to 5, 1⅛ to 1⅖ in snout, 1⅛ to 1⅗ in interorbital; maxillary reaches eye, length 3 to 3⅓ in head; front barbel 4¾ to 5⅖ in head, hind barbel 3⅖ to 3¾; mandible included within upper jaw; interorbital 3⅕ to 3¾ in head, low, nearly level or only very slightly convex; suborbitals cover ⅓ to ⅖ of cheek to preopercle ridge. Gill rakers 2+10, lanceolate, 2¼ in gill filaments which 1⅛ in eye. Pharyngeal teeth 2, 3, 5 – 5, 3, 2, with small terminal hooks and grinding surfaces.

Scales 24 or 25 in lateral line to caudal base and 2 more on latter; 5 above, 3 below, 12 or 13 predorsal, 13 around caudal peduncle. Scales with about 10 imperfect basal radiating striae, none apically; circuli finely concentric, imperfect apically.

D. IV, 8, I, spines slender, with few feeble striae terminally, first branched ray 1⅖ to 1⅘ in head; A. III, 5, I, first branched ray 2 to 2⅛; least depth of caudal peduncle 3 to 3⅛; pectoral 1¾ to 1⅘; ventral 2 to 2⅛; caudal 3½ to 3⅞ in rest of body, well forked lobes pointed.

Back light brown, sides and below whitish, with silvery white reflections. Scales on back with dark edges. Upper surface of head dusky. Iris silvery white. Fins all pale, lower ones whitish. Barbels pale.

Lake Lanao, Mindanao. My specimens agree with Herre's figure, especially in the large head and fourth dorsal spine with its hind edge finely serrated.

1 example. Vicar Landing, Lake Lanao, Mindanao. May 22, 1908. Length, 82 mm.

3 examples. Vicar Landing, Lake Lanao. May 23, 1908. Length, 94–129 mm.

PUNTIUS LINDOG (Herre)

Barbodes lindog Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1569, 1924 [type locality: Lake Lanao, Mindanao (no description)]; Philippine Journ. Sci., vol. 24, p. 304, 1924 (Dansalan, Lake Lanao, Mindanao), p. 706, 1924 (reference); Fishes Herre Philippine Exped. 1931, p. 21, 1934 (Lake Lanao).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 42, 1937 (reference).

Depth 3¾ to 4½; head 2⅔ to 4⅕. Snout somewhat blunt; eye 3½ to 4 in head, equal to somewhat greater than snout, 1$\frac{1}{10}$ to 1½ in interorbital; mouth rather small, terminal, oblique, lower jaw included; upper lip strongly protractile, lips thin and continuous; rostral barbels very small, less ½ eye diameter, maxillary stouter, equal or but little greater than rostral barbels, never equal eye; interorbital rather flat. Pharyngeal teeth 1, 3, 5–4, 3, 1.

Scales 28 to 32 in lateral line; 5 above, 4 below, 11 to 13 predorsal, 12 around caudal peduncle. Scales with concentric striae.

D. III, 8, slender spine smooth or very slightly serrate, height 1½ or less in head; A. iii, 5; caudal deeply forked, lobes pointed, nearly equals head; pectoral i, 15, little over or less 1⅗ in head; ventral i, 8, length 1⅘ to 2.

Dusky above, merging into pale or yellowish on sides and belly. Dark stripe along middle of back from nape to caudal and similar band from upper side of opercle to middle of caudal. Fins all colorless or with slight dusky tinge to caudal and dorsal spines. Length, 132 mm. (Herre.)

Lake Lanao, Mindanao.

PUNTIUS PALATA (Herre)

Figure 28

Barbodes palata Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 2569, 1924 [type locality: Lake Lanao, Mindanao (no description)]; Philippine Journ. Sci., vol. 24, p. 305 (Dansalan, Lake Lanao); p. 706, 1924 (reference).

Spratellicypris palata Herre, Fishes Herre Philippine Exped. 1931, p. 22, 1934 (Lake Lanao).—Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 44, 1937 (reference).

Depth 3¼ to 3⅘; head 3⅕ to 3½, width 2⅕ to 2¼. Snout 3½ to 3⅞ in head from snout tip; eye 4 to 4¼, 1 to 1⅕ in snout, 1 to 1¼ in interorbital; maxillary reaches opposite front eye edge, expansion 2 in eye, length 3¼ to 3⅗ in head from snout tip; small maxillary barbel 2⅓ in eye; lower jaws constricted narrowly and strongly protruded before snout; interorbital 3½ to 4 in head from snout tip, rather low, broadly convex; suborbitals cover ⅓ to ⅔ of cheek. Gill rakers 4+12, lanceolate, 2½ in gill filaments, which 1⅖ in eye. Pharyngeal teeth 1?, 3, 5–5, 3, 2, small, with small terminal hooks and grinding surfaces.

Scales 29 or 30 in lateral line to caudal base and 3 more on latter; 5 above, 3 below, 13 predorsal, 12 or 13 around caudal peduncle. Scales only slightly overlapping, often many may be entirely separated. Scales with 1 to 20 basal striae, usually feeble or imperfect; circuli fine, concentric, imperfect or obsolete apically.

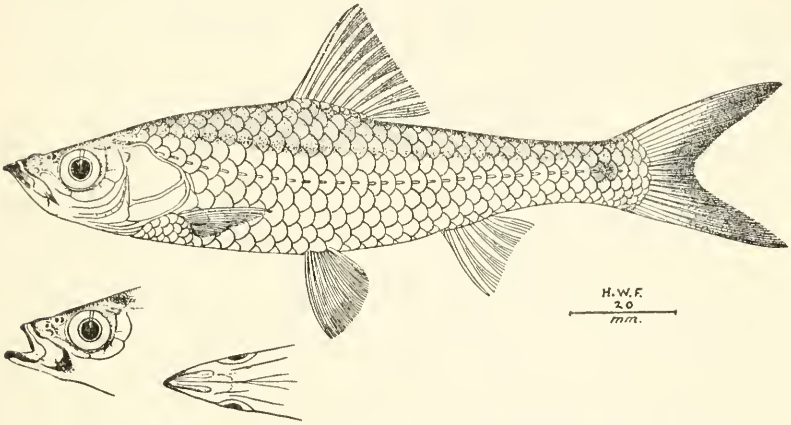

FIGURE 28.—*Puntius palata* (Herre): Specimen from Lake Lanao, Mindanao.

D. IV, 8, i, spines slender, fourth with hind edges feebly through minutely serrated, first branched ray 1¼ to 1⅔ in total head length; A. iii, 5, i, first branched ray 2 to 2⅓; least depth of caudal peduncle 2⅗ to 3; pectoral 1⅖ to 1⅞; ventral 1⅗ to 2; caudal 3⅕ to 3⅓ in rest of body.

Back brown, edge of each scale slightly darker. Middle and lower portions of sides and under surfaces silvery white. Side of head and iris bright silvery white. Faint leaden or grayish blotch, ill defined, at caudal base. Edges of lips and front of snout narrowly blackish. Fins largely grayish, lower ones paler to whitish.

Lake Lanao, Mindanao. Known easily by strongly protruding mandible and slender body.

12 examples. Vicar market, Lake Lanao, Mindanao. May 23, 1908. Length, 85–144 mm.

Genus LEPTOBARBUS Bleeker

Leptobarbus Bleeker, Ichth. Arch. Ind. Prodr., vol. 2, Cyprini, p. 432, 1860. (Type, *Barbus hoevenii* Bleeker, monotypic.)

Body oblong, elongate, abdomen rounded. Head broad, depressed. Mouth slightly inclined, moderately wide, reaches nearly or to eye. Jaws equal. Barbels 4, well developed, rostral pair and maxillary pair at mouth corner. Preorbital nearly a pentagon. Gill openings extending forward below preopercle. Gill rakers short, lanceolate, wide set. Pseudobranchiae present. Pharyngeal teeth spoon shaped, 2, 3, 5–5, 3, 2, with masticatory margin pluricrenulate. Scales moderate, nuchal begin before opercle end. Lateral line curved down, extends somewhat along lower half of tail. Dorsal fin short, with 7 or 8 branched rays, spines weak, without serrae, origin slightly before ventral origin and base without scaly sheath. Anal very short, with not more than 6 branched rays.

Siam, Sumatra, Borneo.

LEPTOBARBUS MELANOTAENIA Boulenger

Leptobarbus melanotaenia Boulenger, Ann. Mag. Nat. Hist., ser. 6, vol. 13, p. 249, 1894 (type locality: Bongon, North Borneo).—Popta, Notes Leyden Mus., vol. 27, p. 150, 1906 (Bo, Borneo).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 3, p. 97, 1916 (northeast Borneo).

Depth 3 to 3¼; head 3 to 3⅗, width 1⅗ to 2½. Snout 3 to 3⅕ in head; eye 3⅛ to 5, 1 to 1⅘ in snout, 1 to 2⅘ in interorbital; maxillary reaches eye, length 2⅘ to 2⅞ in head; front barbel 3 to 4¹⁄₁₀, hind barbel 1¾ to 2⅕; jaws nearly even, or lower sometimes scarcely longer; interorbital 1⅞ to 3⅕, broadly convex; suborbitals about half cover cheek to preopercle ridge in adult, in young cheek largely naked, suborbital ridge quite narrow. Gill rakers 4+9, short, slender points, 2⅔ in gill filaments, which 1¼ in eye. Pharyngeal teeth 2, 3, 5–5, 3, 2, slightly hooked, with well developed grinding surfaces.

Scales 37 or 38 in lateral line to caudal base and 3 more on latter; 6 above, 3 below, 13 or 14 predorsal, 14 around caudal peduncle. Scales with 40 apical radiating striae and 6 basal; circuli finely concentric, incomplete apically.

D. III, 7, I, first branched ray 1⅕ to 1⅖ in head; A. III, 5, I, first branched ray 1½ to 1⅗; least depth of caudal peduncle 2 to 2½; pectoral 1¼ to 1½; ventral 1½ to 1⅔; caudal 3⅛ to 4 in rest of body, well forked, lobes sharply pointed.

Back and upper surfaces olive-brown, lower half of body whitish. Blackish brown blotch, deeper than eye, in humeral region of gill opening. At junctures of longitudinal row of scales close along those of lateral line dark brown band about half scale in width. Iris pale. Fins all brownish, lower ones lighter. Barbels pale.

Borneo.

A 792. Silimpopon River, Sibuko Bay, Borneo. October 2, 1909. Length, 38–252 mm. 3 examples.

Genus RASBORA Bleeker

Rasbora Bleeker, Act. Soc. Sci. Indo-Néerl., (Prodr. Cyprini), vol. 7, p. 435, 1860. (Type, *Leuciscus cephalotaenia* Bleeker, designated by Bleeker, Atlas Ichth. Ind. Néerland., vol. 3, p. 28, 1863.)

Megarasbora Günther, Cat. Fish. Brit. Mus., vol. 7, p. 198, 1868. (Type, *Cyprinus elanga* Buchanan-Hamilton, monotypic.)

Body elongate. Mouth small, oblique, with prominent lower jaw and knob at symphysis fitting more or less into evident notch in upper jaw. No barbels. Gill membranes connected with isthmus opposite pupil, gill opening extending below preopercle. Pseudobranchiae present. Pharyngeal teeth in 3 rows, 1 or 2, 2 to 4, 4 or 5–5 or 4, 4 to 2, 2 or 1. Scales moderate or large. Lateral line bends abruptly down and when complete extends along lower half of tail. Dorsal with 7 or 8 branched rays, inserted between ventral and anal origins. Anal short, with 5 branched rays.

Eastern and southern Asia, the East Indies to Sumbawa and the Philippines. One species African.

ANALYSIS OF SPECIES

a^1. Lateral line complete, reaches anal.
  b^1. Scales 7 between lateral lines over middle of caudal peduncle; scales 26 in lateral line; 12 predorsal scales.
    c^1. Caudal lobes with black subterminal band ------------------ trilineata
    c^2. Caudal lobes uniformly pale; black blotch close above anal origin. lateristriata
  b^2. Scales 9 between lateral lines over middle of caudal peduncle.
    d^1. Scales 26 in lateral line, predorsal 10 ------------------ punctulata
    d^2. Scales 28 to 32 in lateral line, predorsal 12 or 13.
      e^1. Maxillary not reaching eye; dorsal origin midway between snout tip and caudal base ------------------ argyrotaenia
      e^2. Maxillary reaches eye; dorsal origin nearer caudal base than snout tip ------------------ philippina
a^2. Lateral line incomplete, not extending beyond anal ------------ taytayensis

RASBORA TRILINEATA Steindachner

Figure 29

Rasbora trilineata Steindachner, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 61, p. 637, pl. 3, fig. 3, 1870 (type locality: Jahore; Pengulon Patie).—Düncker, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 181, 1904 (Kuala Lumpur Pahig).—Weber and Beaufort, Durch Zentral Sumatra, Maas, vol. 2, Fische, p. 529, 1912; Fishes Indo-Australian Archipelago, vol. 3, p. 67, 1916 (Sumatra, Borneo).—Fowler, List Fish. Malaya, p. 58 (252), 1938 (reference).

? *Rasbora daniconius* Vaillant, Nouv. Arch. Mus. Hist. Nat. Paris, ser. 3, vol. 5, p. 86, 1893 ("Kapoas," Borneo).

Rasbora calliura Boulenger, Ann. Mag. Nat. Hist., ser. 6, vol. 13, p. 249, 1894 (type locality: Senah, Sarawak).

Rasbora caudimaculata Volz, Zool. Anz., vol. 26, p. 559, 1903 (type locality: Samangus, Nebenfluss des Musi, Palembang, Sumatra); Zool. Jahrb., Abth. syst., vol. 19, p. 403, 1904.

Depth 3½ to 3¾; head 3⅗ to 4, width 1⅞ to 2. Snout 3¼ to 4 in head from snout tip; eye 3¼ to 4, subequal with snout, 1⅓ to 1⅖ in interorbital; maxillary largely concealed, reaches eye, length 2⅞ to 3⅛ in head from snout tip; lower jaw very slightly protruded in front; interorbital 2⅗ to 2⅞ in head, broadly convex; suborbitals broad, cover most all of cheek. Gill rakers 2+8, short, lanceolate, ½ of gill filaments, which 1¾ in eye. Pharyngeal teeth 2, 3, 5–5, 3, 2, with slight terminal hooks and grinding surfaces.

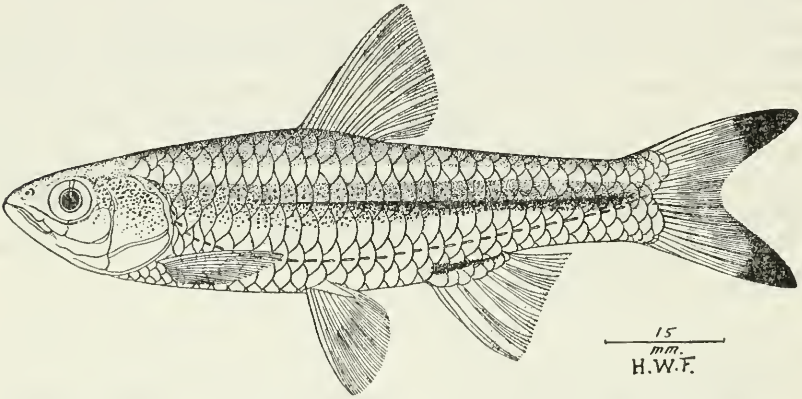

Figure 29.—*Rasbora trilineata* Steindachner: Specimen from Sibuko Bay, Borneo.

Scales 29 in lateral line to caudal base and 2 more on latter; 5 above, 1 below, 11 or 12 predorsal, 12 around caudal peduncle. Scales with 17 or 18 apical and 15 or 16 basal radiating striae; circuli fine and more or less complete.

D. iii, 7, i, first branched ray 1⅒ to 1⅕ in total head length; A. iii, 5, i, first branched ray 1⅖ to 1½; least depth of caudal peduncle 2⅛ to 2⅕; pectoral 1⅕ to 1¼; ventral 1⅖ to 1½; caudal 3⅒ to 3⅓ in rest of body, well forked, lobes pointed.

Back brownish, lower surfaces paler. Sides and head laterally with silvery white reflections. Underlaid leaden gray axial or vertebral line, narrow and at caudal base ends in obscure dull brown spot. Blackish bar along base of anal, narrowing behind. Fins pale or grayish, lower ones whitish. End of each caudal lobe broadly blackish.

Borneo.

24 examples. Silimpopon River, Sibuko Bay, Borneo. October 2, 1909. Length, 58–102 mm.

2 examples. Tawao River, Borneo. September 30, 1909. Length, 83–84 mm.

RASBORA LATERISTRIATA (Bleeker)

Leuciscus lateristriatus (Van Hasselt) Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 7, p. 94, 1854 (type locality: Lake Meningu, Sumatra; Batavia, Tandjorgoost, Tjampea, Bandong, Garut, Java, in rivers).

Rasbora lateristriata Bleeker, Atlas Ichth. Ind. Néerland., vol. 3, p. 121, pl. (17) 118, fig. 2, 1863 (Java, Sumatra).—Günther, Cat. Fishes British Mus., vol. 7, p. 195, 1868 (type: Labuan).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 3, p. 76, 1916 (Java, Sumatra, Borneo, Banguran Island, Lombok).—Herre, Philippine Journ. Sci., vol. 24, p. 265 (Malum River, Tawi Tawi), p. 705, 1924 (reference).—Roxas and Martin, Dept. Agr. Comm. Manila Tech Bull. 6, p. 43, 1937 (reference).—Fowler, List Fish. Malaya, p. 251, 1938 (reference).

Rasbora macrocephalus Bleeker, Nederland. Tijdschr. Dierk., vol. 2, p. 139, 1865 (type locality: Krawang, Java, in rivers).

Rasbora hosii Boulenger, Ann. Mag. Nat. Hist., ser. 6, vol. 15, p. 247, 1895 (type locality: Baram River, Borneo).

Rasbora elberti Popta, Notes Leyden Mus., vol. 34, p. 10, 1911 (type locality: Lombok).

Depth 4½; head 3⅘. Snout 3 in head; eye 3½, subequal with snout, 1⅓ in interorbital; maxillary reaches opposite front eye edge; mouth strongly inclined, front end high as upper pupil edge; interorbital broad.

Scales 26 in lateral line, 5 transversely, 12 predorsal, 7 over caudal peduncle.

D. ii, 7, height 1⅓ in head; A. iii, 5; caudal deeply and broadly forked (broken); pectoral 1⅓ in head; ventral inserted behind eighth scale of lateral line or nearer anal than opercle.

Whitish to yellowish on sides and below, scale margins more or less indicated by broad bands of minute dark dots. Dorsal region dark brown. Top of head blackish brown and narrow blackish stripe from nape to caudal fin. Silvery black spot on opercle. Narrow silvery black stripe along side, beginning behind opercle, darker and more conspicuous along posterior half, bordered above and especially below by broad band formed of minute dark specks. Length, 81 mm. (Herre.)

East Indies, Philippines. Reaches 121 mm., according to Bleeker.

RASBORA PUNCTULATA Seale and Bean

Rasbora punctulatus Seale and Bean, Proc. U. S. Nat. Mus., vol. 33, p. 232, fig. 3, 1907 (type locality: Zamboanga).—Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568 1924 (reference); Philippine Journ. Sci., vol. 24, p. 266 (Zamboanga; Basilan Island), p. 705, 1924 (reference).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 43, 1937 (reference).

Depth 3⅘ to 4¼; head 3⅓ to 3⅘, width 2⅛ to 2¼. Snout 3 to 3¼ in head; eye 2½ to 3½, greater than snout in young to 1¼ in snout with age, greater than interorbital in young to 1⅓ in interorbital with age; maxillary reaches ⅞ or to eye, length 2⅖ to 3 in head; lower jaw included in upper; interorbital 2⅗ to 3, broadly convex; infraorbital covers cheek and postorbital ⅗ of space to preopercle ridge. Gill rakers 2+10, lanceolate, ½ of gill filaments, which ½ of eye. Pharyngeal teeth 2, 3, 5–5, 3, 2, hooked, with slightly grinding surfaces.

Scales 26 in lateral line to caudal base and 2 more on latter; 5 above, 2 below, 11 or 12 predorsal, 14 around caudal peduncle. Scales with 13 to 15 radiating apical striae and 9 or 10 basally; circuli fine, concentric, imperfect apically.

D. II, 7, I, first branched ray 1⅕ to 1¼ in head; A. II, 5, I, first branched ray 1⅗ to 1⅘; least depth of caudal peduncle 2 to 2¼; pectoral 1⅕ to 1⅓; ventral 1⅖ to 1½; caudal 2⅞ to 3¼ in rest of body, well forked, slender lobes sharply pointed.

Back and upper surfaces rather warm brown, under regions paler. Each scale on back with darker margin than ground color. Sides with slightly silvered reflections, also brilliant silvery white on side of head. Iris silvery white. An underlaid dark gray vertebral narrow band, slightly widening posteriorly or on caudal peduncle. Fins all pale, hind caudal edge narrowly dusky.

Philippines.

20 examples. Isabela River, Basilan Island. September 11, 1909. Length, 74–102 mm.

5826. Iwahig River and tributaries, Puerta Princesa, Palawan. April 4, 1909. 59 examples. Length, 46–106 mm.

68 examples. Malatgao and Canino River, Puerta Princesa, Palawan. April 4, 1909. Length, 50–116 mm. Hind caudal edge variously dusky to blackish. An underlaid dull steel blue lateral band though general coloration quite dusky or swarthy.

46 examples. Malbato River, Port Uson, Busuanga Island. December 17, 1908. Length, 41–110 mm.

54 examples. Malinao River, Mantaquin Bay, Palawan. April 2, 1909. Length, 54–112 mm. All show median dark lateral band from preorbital to middle of caudal base, evidently due to preservation.

2 examples. Nakoda Bay, Palawan. December 31, 1908. Length, 85–87 mm.

175 examples. Pangauron River, Port Caltom, Busuanga Island. December 16, 1908. Length 37–133 mm.

13 examples. River at Nakoda Bay. December 31, 1908. Length, 56–96 mm.

9234, 9236, 9240. Zamboanga River, Zamboanga. October 9, 1909. 27 examples. Length, 51–84 mm.

RASBORA ARGYROTAENIA (Bleeker)

Leuciscus argyrotaenia BLEEKER, Verh. Batav. Genootsch. (Mid. Oost Java), vol. 23, p. 21, 1850 (type locality: Banjimas, Gambong, Purworedjo, Surabaya, Java).

Rasbora argyrotaenia Bleeker, Atlas Ichth. Ind. Néerland., vol. 3, p. 123, pl. (21)132, fig. 3, 1863 (Java, Sumatra, Bali).—Günther, Cat. Fishes British Mus., vol. 7, p. 195, 1868 (types; types of *Rasbora dusonensis* and *Rasbora borneensis*).—Steindachner, Abh. Senck. Ges., vol. 25, p. 455, 1900 (East Indies).—Weber and Beaufort, Fishes Indo-Australian Archipelago, vol. 3, p. 61, 1916 (Java, Bali, Sumatra, Borneo, Malay Peninsula, Annam).—Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924 (Busuanga; Lake Manguao and Puerto Princesa, Palawan); Philippine Journ. Sci., vol. 24, p. 267 (description), p. 705, 1924 (reference); Fishes Herre Philippine Exped. 1931, p. 20, 1934 (Concepcion; Busuanga; Culion).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 43, 1937 (reference).—Fowler, List Fish. Malaya, p. 56(251), 1938 (reference).

Pseudorasbora argyrotaenia Fowler, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 500, 1904 (Padang).

Leuciscus cyanotaenia Bleeker, Verh. Batav. Genootsch. (Mid. Oost Java), vol. 23, p. 21, 1850 (type locality: Batavia).

Leuciscus dusonensis Bleeker, Nat. Tijdschr. Nederland. Indië, vol. 1, p. 14, 1850 (type locality: Bandjermassing, in River Duson or Banjer).

Leuciscus schwenkii Bleeker, Act. Soc. Ind. Néerl. (Sumatra), vol. 3, p. 47, 1858 (type locality: Trussan, Western Sumatra, in rivers).

Rasbora borneensis Bleeker, Ichth. Arch. Ind. Prodr., vol. 2, Cyprini, pp. 285, 450, 1860 (type locality: Borneo, Bandjermassin, in rivers).

Rasbora everetti Boulenger, Ann. Mag. Nat. Hist., ser. 6, vol. 15, p. 187, 1895 (type locality: Palawan).

Depth $3\frac{1}{2}$ to $3\frac{3}{4}$; head $3\frac{7}{8}$ to 4. Snout $3\frac{1}{8}$ to $3\frac{2}{7}$ in head from snout tip; eye $3\frac{1}{8}$ to $3\frac{2}{7}$, subequal with snout; maxillary not quite reaching eye, length $2\frac{7}{8}$ in head from snout tip; interorbital $2\frac{2}{7}$ to $2\frac{2}{5}$, slightly convex. Pharyngeal teeth 2, 4, 5 – 5, 4, 2.

Scales 26 or 27 in lateral line to caudal base and 3 more on latter; 4 or 5 above, 1 below, 11 or 12 predorsal.

D. iii, 7, i, first branched ray $1\frac{1}{4}$ in total head; A. iii, 5, i, first branched ray $1\frac{4}{5}$ to 2; caudal deeply emarginate, length $2\frac{1}{2}$ in rest of body; pectoral $1\frac{1}{8}$ in total head; ventral $1\frac{3}{5}$.

Back brown, below paler, only trace of silvery lateral streak. Fins pale.

Malay Peninsula, Siam, Annam, East Indies, Philippines. According to Weber and Beaufort reaches 170 mm.

A.N.S.P. Nos. 27407–27408. Padang, Sumatra. A. C. Harrison and H. L. Hiller. Length 70 and 90 mm.

RASBORA PHILIPPINA Günther

Rasbora philippina Günther, Rep. Voy. *Challenger*, vol. 1, p. 54, 1880 (type locality: Pasamanca, near Zamboanga).—Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924 (Zamboanga and Cagayan de Misamis, Mindanao); Philippine Journ. Sci., vol. 24, p. 268, 1924 (Titunod River, Mindanao; Cagayan de Misamis); Fishes Herre Philippine Exped. 1931, p. 20, 1934 (Kolambugem, Lanao Province).—Roxas and Martin, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 43, 1937 (reference).

Depth $3\frac{1}{3}$ to $3\frac{4}{5}$; head $3\frac{4}{5}$ to 4. Snout $3\frac{1}{5}$ to $3\frac{3}{5}$ in head; eye $2\frac{1}{2}$ to $3\frac{1}{5}$, greater than snout, 1 to $1\frac{1}{3}$ in interorbital; maxillary reaches front eye edge; mouth oblique, upper end about level with upper pupil edge; lips thin; upper with median notch into which symphyseal knob of projecting lower jaw fits; interorbital nearly flat. Pharyngeal teeth 1, 4, 5 – 5, 4, 1.

Scales 29 or 30 in lateral line; 5 above, 1 below, 12 predorsal, 9 rows over middle of caudal peduncle. Sometimes row replaced by rows of very small scales.

D. ii, 7, height $1\frac{1}{3}$ to $1\frac{1}{4}$ in head; A. iii, 5, height to $1\frac{1}{3}$ or more; caudal longer than head, longest rays more than twice shortest; pectoral $1\frac{1}{5}$ to $1\frac{1}{3}$ in head; ventral $1\frac{2}{5}$.

Yellowish brown, back darker and fading yellowish white on throat and belly. Top of head blackish. Narrow dark brown stripe from nape to dorsal. Broad dark brown band from shoulder to caudal, often with central black line, above which may be pale streak, or either or both also absent. Scales on sides outlined by broad dark marginal bands or rows of dots. Brown streak along anal base and rows of brown dots on ventral margin of caudal peduncle. Fin rays more or less dusky dotted or colorless. Length, 72 mm. (Herre.)

Mindanao.

RASBORA TAYTAYENSIS Herre

Rasbora taytayensis Herre, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924 [type locality: Taytay, Palawan (no description)]; Philippine Journ. Sci., vol. 24, p. 264, 1924 (between Taytay and Malampaya Sound, Palawan; creek near Taytay).—Roxas and Martin, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 43, 1937 (reference).

Depth $3\frac{1}{4}$ to $3\frac{1}{2}$; head $3\frac{1}{2}$ to $3\frac{3}{4}$. Snout blunt, short, $1\frac{1}{7}$ to $1\frac{1}{3}$ in eye; eye 3 to $3\frac{1}{2}$ in head, greater than snout, $1\frac{1}{4}$ to $1\frac{1}{3}$ in interorbital; mouth rather wide, very oblique, hind edge not reaching eye; lips thin, subequal or lower projecting, with prominent knob at symphysis fitting into median notch in upper lip; interorbital flat.

Lateral line incomplete, scales 15 to 17, longitudinal series of scales 26 to 28; 5 above, 1 below, predorsal 11.

D. ii, 7, height slightly less than head; A. iii, 5, height $1\frac{1}{5}$ to $1\frac{1}{3}$ in head; caudal deeply forked, longer than head, longest rays of pointed lobes less twice long as shortest rays; pectoral $1\frac{1}{10}$ to $1\frac{1}{3}$ in head; ventral origin opposite ninth scale of lateral line, its tip about reaching vent.

Silvery brown, very dark above, paler below. Narrow black stripe on back from nape to caudal. Blackish or dark silver line or band along side on hind half of body, with black circular spot at caudal base. Below broad dark band, beginning behind eye, best developed anteriorly and composed of many fine dots. Dark brown bar behind

hind edge of gill opening. Scales margined with many fine dark spots. Band of many black spots along anal base. Fins colorless or rays more or less dark dotted. Length, 60 mm. (Herre.)

Palawan. Allied with *Rasbora semilineata* Weber and Beaufort.

Genus NEMATABRAMIS Boulenger

Nematabramis BOULENGER, Ann. Mag. Nat. Hist., ser. 6, vol. 13, p. 249, 1894. (Type, *Nematabramis everetti* Boulenger, monotypic.)

Mearnsella SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 231, 1907. (Type, *Mearnsella alestes* Seale and Bean, orthotypic.)

Body oblong, much compressed, with trenchant ventral edge. Upper profile slightly inclined from snout to dorsal, somewhat convex, slightly concave on head and nape. Eye with free orbital edge. Mouth gape moderately large, obliquely directed upwards, lower jaw slightly longer than protractile upper jaw. More or less developed symphyseal knob, fitting in corresponding shallow cavity in upper jaw. Pair of long maxillary barbels. Gill opening extends below eye. Gill rakers short. Pseudobranchiae present. Pharyngeal teeth 4, 5—5, 4, hooked. Scales rather large, subequal, predorsal beginning far behind eye. Lateral line abruptly bent down behind pectoral fin and runs close to lower profile of body, separated by 2 scales. Dorsal fin short, without strong spines, entirely opposite anal. Anal much longer than dorsal, rays 12 to 18. Caudal deeply emarginate. Pectoral longer than head. Ventral with 6 branched rays, inserted slightly above abdominal profile, separated from lateral line by 1 scale.

Borneo and Philippines.

ANALYSIS OF SPECIES

a^1. NEMATABRAMIS. Barbels 1½ to 2 times longer than head________ everetti
a^2. MEARNSELLA. Barbels shorter than head__________________________ alestes

Subgenus NEMATABRAMIS Boulenger

NEMATABRAMIS EVERETTI Boulenger

FIGURE 30

Nematabramis everetti BOULENGER, Ann. Mag. Nat. Hist., ser. 6, vol. 13, p. 250, 1894 (type locality: Palawan); ser. 6, vol. 15, p. 187, 1895 (Palawan).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 3, p. 46, 1916 (Palawan).—HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924 (reference); Philippine Journ. Sci., vol. 24, p. 262 (compiled), p. 705, 1924 (reference).—ROXAS and MARTIN, Dept. Comm. Agr. Manila Tech. Bull. 6, p. 43, 1937 (reference).

Depth 3 to 3 ⅖; head 3½ to 4, width 2 to 2⅛. Snout 3⅖ to 3¾ in head from snout tip; eye 3⅔ to 4$\frac{1}{10}$, 1⅛ to 1⅕ in snout, 1½ to 1⅗ in interorbital; maxillary reaches eye or ⅕ in eye, length 2⅓ to 2⅖ in head measured from snout tip; barbel at least larger than head or to middle of pectoral, to ventral origin with age; lower jaw slightly projects in front; interorbital 2⅖ to 2½ in head, broadly convex, with 6 transverse ridges each side of median line; broad suborbitals entirely cover cheek. Gill rakers 3+9, short, slender points, ½ of gill filaments which 1½ in eye. Pharyngeal teeth 4, 5–5, 3, hooked, each of larger with moderate grinding surface.

Scales 32 or 33 in lateral line to caudal base and 3 more on latter; scales 32 to 36 in median lateral series to caudal base and 3 more on latter; 8 above, 2 below, 21 or 22 predorsal, 13 around caudal peduncle. Scales with 10 to 14 radiating apical striae, sometimes single basal stria; circuli fine, concentric, best developed basally.

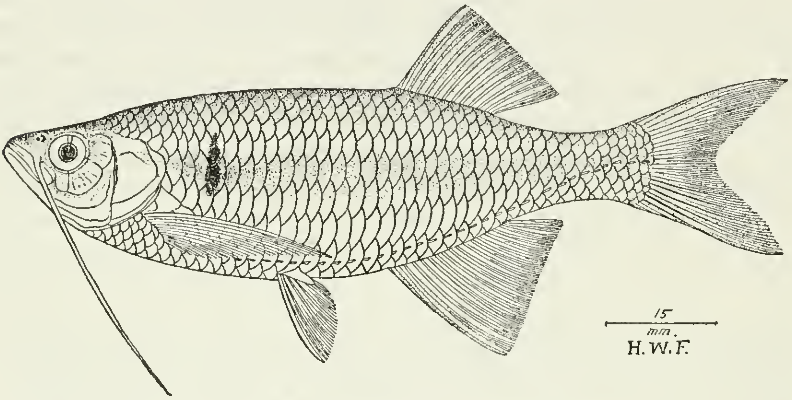

Figure 30.—*Nematabramis everetti* Boulenger: Specimen from Tawao River, Borneo.

D. ii, 11, i, first branched ray 1⅓ to 1⅖ in total head length; A. iii, 16, i, first branched ray 1⅒ to 1⅕; least depth of caudal peduncle 2⅓ to 2⅔; ventral 1½ to 1⅘; caudal 3 to 3¼ in rest of body, deeply lunate, lobes pointed; pectoral 3 to 3¼.

Light brown generally, paler to whitish below and whole body with more or less silvery white reflections. Iris silvery white. Dark or blackish narrow vertical bar on fourth scale from upper edge of gill opening. Deep brown blotch size of eye at middle of caudal base. Indistinct underlaid narrow axial grayish streak to middle of caudal base. Fins all pale, most of verticals with more or less grayish terminally.

Borneo. Represents subgenus *Nematabramis* Boulenger in the long barbels. The species superficially suggestive of *Esomus.*

18 examples. Silimpopon River, Sibuko Bay, Borneo. October 2, 1909. Length, 51–95 mm.

43 examples. Tawao River, Borneo. September 30, 1909. Length, 52–110 mm.

Subgenus MEARNSELLA Seale and Bean

NEMATABRAMIS ALESTES (Seale and Bean)

Mearnsella alestes SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 231, fig. 2, 1907 (type locality: Zamboanga).

Nematabramis alestes HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1924 (Zamboanga, Mindanao; Puerta Princesa and Taytay, Palawan, Busuanga); Philippine Journ. Sci., vol. 24, p. 260, 1924 (Basilan Island; Burakan River; Busay River; Balactasan River); Fishes Herre Philippine Exped. 1931, p. 20, 1934 (Karig Malan River and Halsey Harbor, Culion).—ROXAS and MARTIN, Dept. Agr. Comn. Manila, Tech. Bull. 6, p. 43, 1937 (reference).

Nematabramis verecundus HERRE, Proc. Pan Pacific Sci. Congr., Australia, vol. 2, 1923, p. 1568, 1923-24 [type locality: Titunod River, north coast of Mindanao (no description)]; Philippine Journ., Sci., vol. 24, p. 259 (type), p. 705, 1924 (reference).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 43, 1937 (reference).

Depth 3 to 3½; head 3¾ to 4, width 1⅘ to 2⅛. Snout 3⅕ to 3⅖ in head from snout tip; eye 3½ to 4, equals snout in young to 1¼ in snout with age, 1⅖ to 1¾ in interorbital; maxillary reaches eye or ⅕ in eye, length 2¼ to 2⅗ in head from snout tip; barbel 1⅖ to 1¾; jaws sometimes nearly equal, lower usually protruding; interorbital 2⅕ to 2⅖, broad, convex; broad suborbitals cover cheek. Gill rakers 3+6 to 8 short weak points, about ⅓ of gill filaments, which ⅗ of eye. Pharyngeal teeth 4, 5 – 5, 4, hooked, with grinding surfaces.

Scales 36 or 37 in lateral line to caudal base and 2 more on latter; 34 or 35 scales in median lateral series to caudal base and 2 more on latter; 7 above, 1 or 2 below, 22 or 23 predorsal, 12 around caudal peduncle. Scales with 16 to 19 convergent apical striae, 1 or none basally; circuli fine, all basal.

D. II, 8, I, first branched ray 1⅓ to 1½ in total head length; A. III, 12, I, first branched ray 1⅕ to 1¼; least depth of caudal peduncle 2 to 2⅛; ventral 1¾ to 1⅘; caudal 2⅞ to 3⅛ in rest of body, deeply forked, slender lobes pointed; pectoral 3 to 3⅖.

Brownish, under surfaces paler to whitish and sides with more or less brilliant silvery white reflections. Iris silvery white. Barbels pale. Vertical fins all grayish terminally. Paired fins pale. Blackish vertical short bar on fourth or fifth scales behind shoulder. Leaden underlaid band, ill defined, along side of body posteriorly appearing at its terminus a little expanded and slightly darker.

Philippines.

9 examples. Caiholo River, Ulugan Bay, Palawan. December 29, 1908. Length, 74-100 mm. Only narrow pale gray streak along caudal peduncle and above anal axially.

15 examples. Creek at Hacienda below Pancol, Malampaya Island, Palawan. December 26, 1908. Length, 58–106 mm.

64 examples. Isabela River, Basilan Island. September 11, 1909. Length, 55–123 mm. Blackish blotch above pectoral variable, often with several indistinct smaller bars or spots about it.

5825, 5827 to 5833. Iwahig River and tributaries, Puerta Princesa, Palawan. April 4, 1909. Length, 50–129 mm. 92 examples. One example, 98 mm. long with abnormal back, the predorsal profile slightly convex medially.

74 examples. Malatgao and Canino River, Puerta Princesa, Palawan. April 4, 1909. Length, 42–113 mm. Basal scale pockets of side more or less heavily pigmented blackish in places giving an irregular variegated appearance of some scattered short vertical bars.

18 examples. Malbato River, Port Uson, Busuanga Island. December 17, 1908. Length, 34–90 mm.

29 examples. Malinao River, Mantaquin Bay, Palawan. April 2, 1909. Length, 38–115 mm.

28 examples. Pangauron River, Port Caltom. December 16, 1908. Length, 65–120 mm. Median dark axial lateral band, neutral dusky or dark neutral slate to caudal base. *Nematabramis verrecundus* founded on a specimen but 42 mm. long with coloration such as these specimens, differs only in its greater depth of 2⅝, though I have specimens of such depth which are surely *Mearnsella alestes*.

9235, 9237 to 9239, 9241. Zamboanga River, Zamboanga. October 9, 1909. Length, 71–110 mm. 52 examples.

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